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Electrical World

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for

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Accepted Devices applied to new uses

As the name implies, this is a PRImary reZIStance type of starTOR—the simplest of types—and the PRI-ZIS-TOR is the correct interpretation of this type.

At start there is connected to line a circuit consisting of motor and the resistors in series with motor primary. These resistors are short circuited in balanced steps as the motor accelerates.

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Factory Engineers

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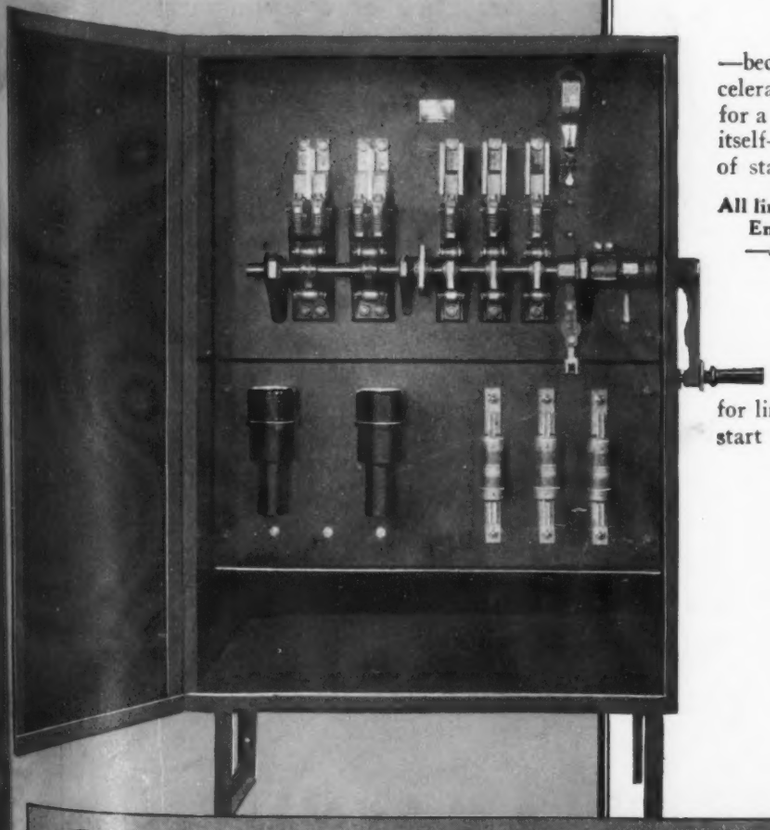

Central Station Engineers

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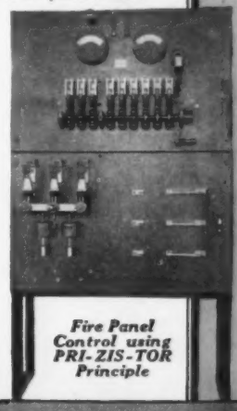

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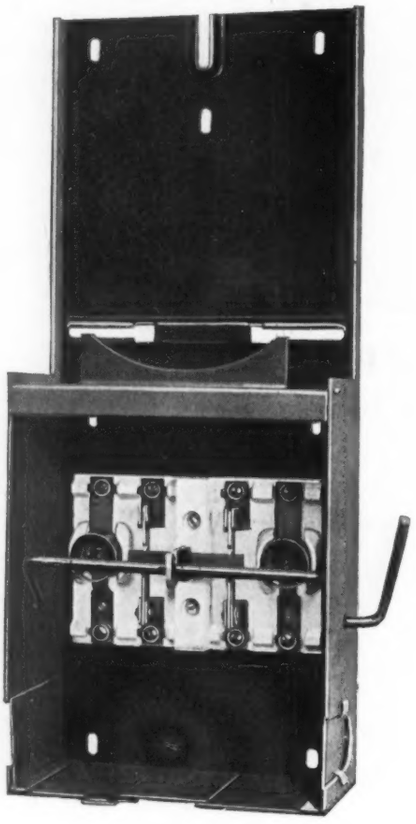

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Electrical World

New York, Saturday, December 3, 1921

To Level the Peaks of Boom and the Valleys of Depression

DOWN through the years this country has watched the steady operation of a business cycle that has brought us alternate peak periods of boom and valleys of depression. The peak points of the booms are areas of speculation, overexpansion, extravagance in living, relaxation in effort, wasteful expenditure in industry and commerce, with consequent destruction of capital. The valleys are marked with business stagnation, unemployment and suffering. Both of these extremes are vicious and hurtful. We know it. Then why should we drift on longer without making an attempt to govern this economic ebb and flow?

The production processes of business may be broadly set into two classes—(1) additions to national plant and equipment, such as houses, stores, factories, railroads and tools, and (2) consumable goods. We have always gone ahead with both at the same time. In boom periods we have put these classes of production into competition. In bad years we have allowed them both to languish.

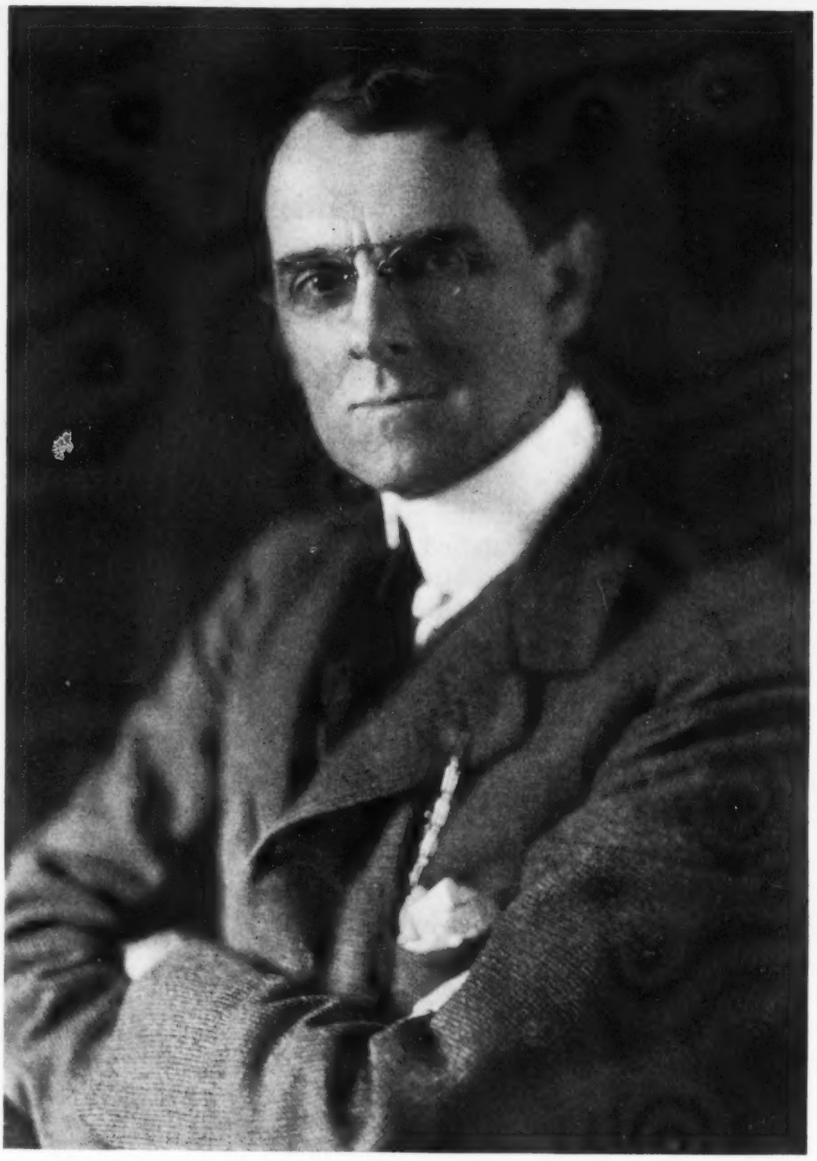
Now, the demand for consumable goods cannot be directly controlled. But it should be possible to control the period in which the expansion of the national plant and equipment takes place. Federal, state and municipal authorities and public utilities throughout the land could to some degree set aside reserves in time of prosperity for the deliberate purpose of financing public works, construction and plant expansion during times of depression. If this were done, it would decrease the depth of depressions and at the same time diminish the height of booms. It is calculated that such a construction reserve of 10 per cent would almost level out the curve of business. And our plant and equipment would be built in times of lower cost.

Unemployment likewise can and must be met in the same way. We must have a labor load dispatcher and prevent the demands for labor for construction and other controllable work from competing with harvest times and the unchangeable seasonal occupations. A way must be found to distribute our labor to a more even load of work and to distribute our work with a regard to economic needs. The subject is one of most profound national importance. If it is possible to do this thing, we must not wait for it longer. California has already taken the first step by providing for the control of public works to this end.

The ELECTRICAL WORLD believes that business men of every industry should make immediate demand for a national statistical service that will determine accurately the production of stocks, the consumption of commodities, the volume of construction and the actual unemployment at all times. Such a service in itself would contribute mightily toward this big reform which the world of business needs.

John Boswell Whitehead

A teacher, engineer and scientist whose original investigations of the properties of air at high voltages have been important additions to the fundamentals of power transmission at high potentials.



IN A LETTER which Sir William Thomson (Lord Kelvin), the famous English mathematical genius and scientist, wrote to Silvanus P. Thompson he began with this remark: "You have splendidly verified the validity of my applying to you for information not to be found in encyclopedias or ordinary textbooks on a very interesting and important scientific subject." In this country such sources of scientific information are in the main two—the research laboratories, which are often difficult of access, owing to the commercial value of their findings, and the private laboratories of the scientists in our universities. When new physical and scientific information comes from the latter source, hampered in most instances by impoverished facilities, there is invariably revealed a genius devoted to the highest ideals of scientific investigation. Not infrequently, because of their modesty, are these geniuses discovered among us by their contemporaries in foreign lands.

Such is in part the case of Dr. J. B. Whitehead, to whom the Institut Electrotechnique Montefiore of Liège, Belgium, has recently awarded the triennial prize of 5,000 francs, known as the Foundation George Montefiore, for the best orginal work on scientific advancement or progress in technical applications of electricity. This prize is awarded on the recommendation of a jury formed of ten electrical engineers, of whom five are Belgians and five are from other countries. The paper which won this recognition was entitled "The Corona Voltmeter and the Electric Strength of Air," presented by Dr. Whitehead and T. Isshiki before the American Institute of Electrical Engineers more than a year and a half ago.

Dr. Whitehead was born in Norfolk, Va., Aug. 18, 1872. He was graduated from Johns Hopkins University, with the degrees of E. E. in 1893, A. B. in 1898 and Ph.D. in 1902. During the period of 1893 to 1896 he was associated with the Westinghouse Electric & Manufacturing Company on transformer design, and from 1896 to 1897 he was a member of the operating staff of the Niagara Falls Power Company. He resigned that position to join the faculty of Johns Hopkins University, advancing to be professor of electrical engineering in 1910 and dean of the School of Engineering in 1919. During this period he has been associated with the Bureau of Standards on special research and was research assistant at the Carnegie Institute, Washington, from 1902 to 1905. Dr. Whitehead has also carried on a consulting engineering practice, acting in this capacity for the Maryland Electric Railways. His principal effort, however, has been the study of different phases of experimental research, with special endeavor directed to investigation of the electric properties of air. Ten or twelve papers giving details of his investigations have been published. His studies along these lines have resulted in the invention of the corona voltmeter, for which he has fundamental patents.

In the affairs of the American Institute of Electrical Engineers Dr. Whitehead has always taken an active interest. He has served as a member of a number of committees and for two years was chairman of the electrophysics committee. He inaugurated the movement which led to the foundation of the Baltimore Section of the Institute and was its chairman for the first nineteen years. During the war Dr. Whitehead was commissioned major in the Corps of Engineers and detailed to the Naval Consulting Board, working on a development of an electromagnetic submarine detector. An account of this was published in the *Journal* of the A. I. E. E. for March and April, 1920.

Dr. Whitehead has an unusual ability to foresee needed research and to incorporate in the investigations which he directs those practical considerations which are too often ignored by many researchers. His devotion to research and the clearness with which he conceives the problems involved make his viewpoint much sought at meetings of both engineers and scientists.

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A Makeshift Revenue Bill

"THE mountain labored and brought forth a mouse." Little satisfaction can be found in the revenue bill passed by Congress last week. Admittedly a makeshift, the best that can be said of it is that it is a trifle better than the one it superseded. The two measures differ, however, about as much as alternating current does from direct current. You can do things with the one that you cannot do with the other and vice versa. But if one wants to commit suicide the general effect of either is about the same. So it is with the revenue bills. Applied long enough, either one would suffice to kill business. There is no need of looking at the reductions made in the new bill. Some have been made, but nothing worth bragging about. The law will not remain long in effect—of that we may be certain. There is already talk of its revision before the Treasury Department has made its regulations based on the statute and the courts have interpreted both. Thus business will not only be hampered by further indecision, but the country as a whole will never be able to compose itself until a more moderate and stable tax law has been enacted. Billions are required of us because we have wasted our substance in riotous expenditure for that which contributes naught to the public welfare. This extravagance must be checked. We, as a people, are anxious and willing to maintain the finest government on the face of the earth and gladly pay taxes for that purpose, but waste and inefficiency we must away with, and the surest way to check them is to limit the available funds. This check cannot be applied any too soon, and we shall never be satisfied until we obtain a reasonable and scientific tax law and a Congress not itching to add unnecessarily to the functions of government or even anxious to assume meritorious functions at too fast a pace.

A Policy that Robs the Till

ONE day early this year the sales manager of a certain central-station company walked into the office of the president, with a sober face, and said: "I find that some one has stolen $12,000 out of the cash drawer." The president sat back aghast and asked him how. The answer was that that amount had been lost in 1920 by not charging a proper profit on merchandise sold and on repair jobs done for customers. The money had been lost. Not one thief, but many good customers, had been allowed to help themselves unconsciously out of the company's cash drawer. And this occurs in many cities.

After all, there is no policy involved save one, the policy of good business. For electrical appliances are worthy and popular enough to be salable at a proper price that pays a profit. And business that does not pay its way and a profit is not good business. All the arguments in the world cannot prevail against that simple fact. Why, therefore, should the central-station company go on robbing its till with its own hand by selling goods on a losing basis?

The market for electrical appliances today is only opening in the bud. It will increase and develop to proportions now beyond imagination. The central-station shop, if policy is right, will sell in growing volume. It can and should be the leading, guiding store in every city, working actively and progressively in a harmonious helpful co-operation with an increasing number of dealers' stores. For electrical appliances are destined to become standard household equipment and, as such, staple merchandise that everybody sells. But the first step must be to make each electric store—central-station or otherwise—a store that pays. Under any other policy that store is headed toward the rear. The electrical appliance is going ahead, and he helps most who makes his store prosperous and strong to serve.

A Plain Case of Hallucination

WE HAVE several times recently drawn attention to the disposition on the part of the ignorant and careless to lay at the door of electricity every fire that occurs anywhere within a few blocks of an electric circuit and is not obviously due to some other cause. Recently a daily paper that ought to know better published an extraordinary communication ascribing the Hoboken (N. J.) pier fire to the malign influence of current which indulged in a flying leap from the lighting circuits to the water. The author of this weird theory maintains that transformer oil is a conductor of 2,300-volt current, wherefore the source of the conflagration becomes plainly evident. In fact, the story seems to be the product of one of the most elaborate sets of "wheels" yet possessed by any pseudo-scientist.

The moral which we desire to draw from this tale is simply the depths to which human foolishness can go and the truly abysmal credulity of a considerable part of the daily press. A few papers are singularly free from display of gross ignorance on technical matters, evidently having some one around the office who keeps an eye out for just such wild theories as the one under comment. It more generally happens, however, that any sort of drivel couched in technical terms "gets by" the editorial staffs of daily papers, and consequently gross misinformation often reaches the public.

Newspapers may be pardoned for ignorance of abstruse scientific matters, but not for the display of it when in every city a telephone call in the right direction is all that is necessary to ascertain the truth. We have in mind a daily paper which, receiving a somewhat sensational technical announcement in the press dis-

patches, routed its scientific mentor out of bed by telephone and cleared the matter up then and there. It is an example worthy to be followed, especially when, as in the Hoboken instance, the technical question concerned involved gross misstatements of fact and baseless accusations of the most sweeping character.

Help the Consulting Engineer

SOME central-station companies and many of their consumers cannot afford to maintain engineering organizations competent to handle all their engineering problems, because many of those problems are special in character and present themselves only at long intervals. Even those companies and consumers that maintain large engineering organizations find themselves frequently confronted with problems demanding specialized skill and must resort to outside organizations for advice. Such advice and guidance can be provided only by engineers whose work extends over a large territory and embraces a large volume of diversified practice. The most serious criticism that has been made of the services rendered by such engineers is that they have usually been content to complete their work, get their pay and forget the trouble that may develop in the course of regular operation. This criticism has been unfair to many conscientious consulting engineers, but it is true that there has been too much of the casual in the relations between consulting engineers and their clients.

If an engineer is to do effective work and learn the most from his mistakes, he must feel that he is not only responsible for the original design and installation but also for the weaknesses that may develop after the work is turned over to the operator. The engineering organizations maintained by the larger operating companies have had an advantage over the consulting engineers in many instances because their men have not only been responsible for the design and installation of the plant but have had to live with it in its operation and be responsible for the removal of any difficulties that have developed. To bring about something like this condition for the consulting engineers will be a benefit to both the engineer and his client. The electrical industry is a long way from the point where every operating company can maintain its own engineering organization on a broad enough scale to handle all its problems. It is essential, therefore, that the functions of the consulting engineer should be recognized on a broad basis and such relations established with him as will result in mutual profit to him and his client from the experiences gained in operation.

Providing for 220,000-Volt Operation Without Radical Departures in Design

DETAILS of the Big Creek No. 8 station of the Southern California Edison Company, which has been built for 220,000-volt operation, indicate that the step from 150,000 volts to this higher voltage has been made without material changes in construction. Before plans were actually put on paper it was thought that the advance in voltage might be marked by radical changes in design and layout. This has not been found necessary. None the less the new station is of unusual interest for the very reason that it is so much like stations of lower voltage. Placing the high-tension equipment indoors has made the likeness particularly marked.

Plants of the new station published on another page of this issue show that a steel-frame building having a content of approximately 575,000 cu.ft. was built to house the transformers, high-tension switches and high-tension buses. If the apparatus had been placed outdoors, then cost would have been reduced to that necessary to support the apparatus, but the additional expenditure involved in housing it was considered justifiable because of the greater ease of inspection and maintenance thus afforded.

The station layout is very simple. There are no low-tension buses, and the connections between the generator, the low-tension switch and the transformers are direct and substantial. The elimination of low-tension buses is a progressive step and achieves a substantial reduction in the number of possible causes for trouble. In order still further to reduce the possibilities of low-tension troubles, the supply of energy for station lights and auxiliary motors is taken, not from the 110,000-volt output of the generator, but from an entirely separate 6,600-volt generator driven by an independent impulse wheel.

The entrances of the 220,000-volt lines and the layout of the high-tension wiring have been simplified to the extreme. The lines are brought straight into the building through large openings in the walls on two floors and connect directly to the high-tension buses. No 220,000-volt lightning arresters are installed. Only two high-tension oil switches are to be used, and of these only one has yet been installed.

A Clearing House for Technical Information

IN THE ambitious program of the National Electric Light Association for the reorganization of its technical committees on a broader scale there is created a practical machine for widespread co-operation in engineering matters through the activities of the national geographic committees that have been organized to co-operate with one another in gathering data and information. The state association committees are also being brought into the activities, as it is being discovered that they are an essential link in the chain necessary to bring the individual companies into close touch with the entire central-station industry of the country. The major problems of the industry should be reflected in all their different phases, since through the touch gained by the co-operation of the committees, both state and geographic, any valuable work done by individuals in one company will be accessible to any one engaged in similar work in another company. Possibilities for greater standardization, more complete education of personnel and ability to get valuable information quickly should be some of the immediate results.

The expenditure of considerable effort and of some money will, however, be necessary to develop the full benefits of the program. Engineers who have been in close touch with the work are convinced that much good has already been done. It is essential that company executives realize the value of the work if all companies, small and large, are to profit by it. One of the big benefits, in addition to the work done and the information gleaned by the men in attendance, is the contact with the industry and the resulting realization that what seem to be individual problems are, after all, common problems and have perhaps been solved by those

who have had to face them before. This leads to a study of what others have done and acts as a real preventive of serious mistakes that may have been made many times before.

The work needs only the moral and financial support of executives through the ordinary channels of the association, but support that will make it possible for their men to attend not only the committee meetings of the division and state committees, but the National Technical Section group meetings arranged for various parts of the country. However good the organization idea may be, it can be of value only as long as an unbroken line of personal contact with the committees, from the local to the national, is maintained. Any break in this personal contact will be a direct loss to the individual and the company he represents and also a means of lowering the efficiency of the organization. The scheme involves the keeping of a membership in the national committees that is drawn to a large degree from the division committees handling the same subjects. In turn the division committees should contain members representing every state committee on the same subject and every company in the division having an interest in it. It is the most ambitious plan that has been worked out by the association for co-ordinating the engineering work of the central-station industry, and the plan deserves wholehearted support.

Interest in Static Condensers Warrants Development

CONSIDERABLE attention is being given, especially by some of the large electric utilities, to the use of condensers as a remedy for bad power factor. We do not refer to the synchronous condenser, which is of course often used on long feeders or transmission lines, but to the straight static condenser applied locally to bring up the power factor of induction motors. Where heavy machinery is in question the synchronous motor does a good job and can be made greatly to relieve the power factor. In very small machines the call for current is relatively insignificant, and nobody worries much provided that the power factor is kept within tolerable limits. One is hardly tempted, however, to use a synchronous motor under 100 hp., and right here is where the static condenser comes into play down to sizes which are customarily wound for rather modest voltage.

The static condenser, as our older readers will remember, was in use by William Stanley and his associates some thirty years ago for the very purpose for which it is now being reintroduced. The Stanley motor of that day had a magnetic circuit decidedly unfavorable from the standpoint of power factor, and the addition of the condenser not only remedied the difficulty but actually did bring the machine to substantially unity power factor over a wide range of load. There are plenty of extant tests showing the effectiveness of the procedure. Now the condenser is coming back, but whether it is coming into its own is another question. Only a few days ago W. C. L. Eglin, chief engineer of the Philadelphia Electric Company, described the experiments of his company with static condensers which it imported at moderate expense in the absence of any standard equipment obtainable here. Other large companies have quietly been trying the same kind of experiments.

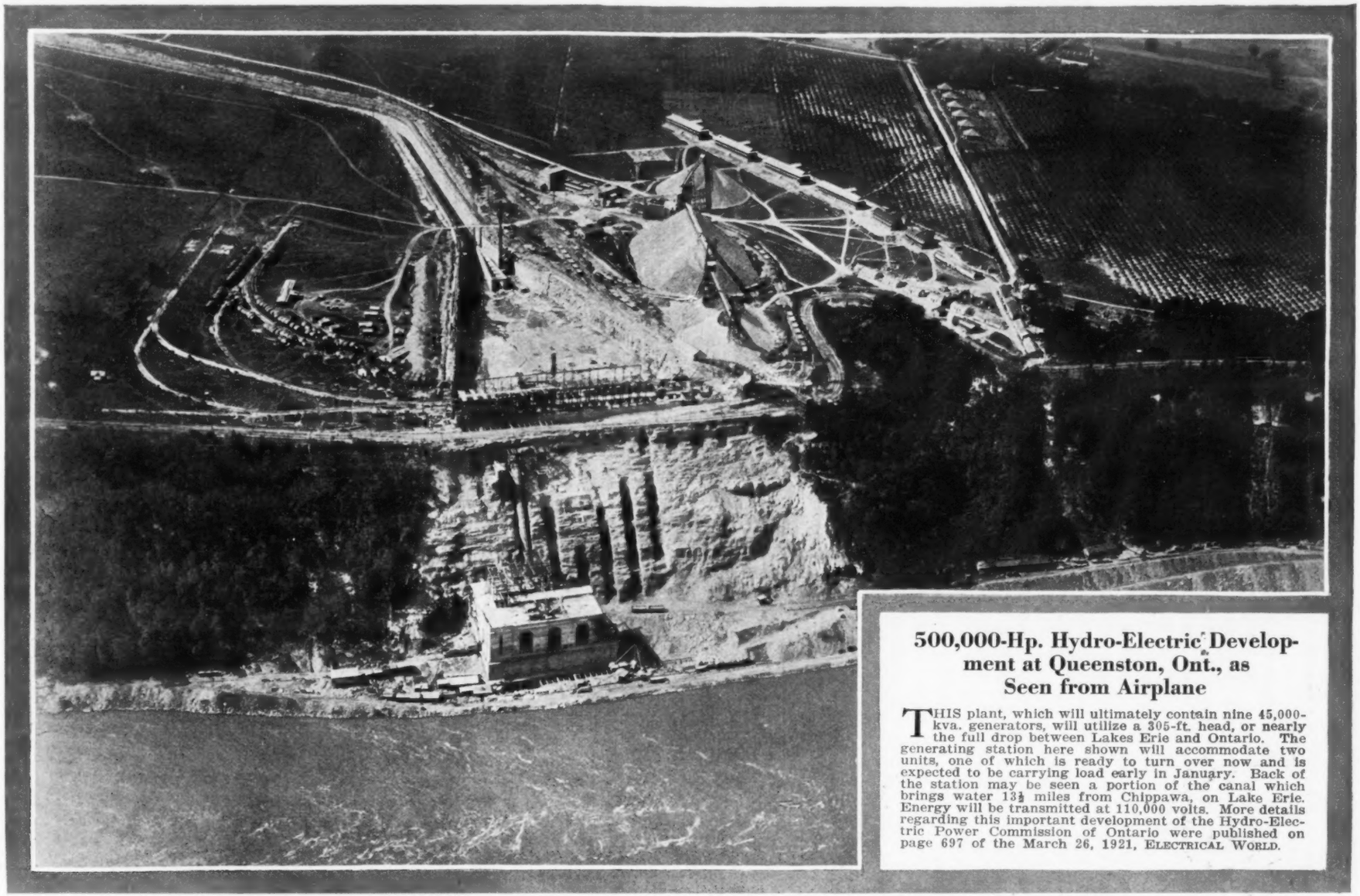
Power factor is certainly of sufficient importance to justify a serious attack along any line which promises success, and the static condenser furnishes such a line. Apparently we in this country are in this particular behind the game to a degree that is altogether regrettable. If our American manufacturers are ready to take up the matter and furnish a standard and reliable product, let them step forth. They will receive a cordial welcome from a great many badgered central-station operators.

The Natural Limitations of Municipal Power Developments

MUNICIPAL lighting and municipal power supply have long formed a bone of economic contention. Broadly there are many reasons why municipalities should not go into power enterprises. Chief among these is just plain graft, the strong probability that politics will get into the operation of a plant and make it a costly and an unsatisfactory investment for everybody except the grafters. One cannot go quite so far as the Psalmist and proclaim, "There is none righteous, no, not one," among city governments, because we know of some that have shown, at least in other things than municipal electric plants, a very high degree of honesty and common sense; but such a happy condition is unfamiliar in far too many communities.

As electric enterprises grow to larger dimensions another phase of municipal ownership rises to great importance. A city which merely runs its own plant from sources of power within its own boundaries has a simple problem in hand. If it goes into a power transmission scheme on such a scale that all the power will be promptly absorbed within the municipality, the difficulties are comparatively small. As extension goes on, however, a question must arise as to the rightfulness of a municipality investing its funds extraterritorially for developing power from a source which in equity belongs to other communities as well. Roughly, the question is this: Is a city justified legally or morally in issuing bonds to promote a transmission system passing three or four other municipalities which need power from the same source, when no provision for supplying these communities is made? On the other hand, if it does supply them, is it not going far beyond its municipal rights? Similar questions arise on a greater scale when interstate relations are concerned.

A private corporation can distribute and should distribute power wherever its lines can reach. It is not hampered in the issuance of securities for work in one or many states. A municipality, however, has certain charter limitations upon its power of borrowing money and with respect to the purposes for which loans may be obtained. It is for this reason ordinarily in a rather bad situation with respect to engaging in enterprises outside its own territorial limits. Difficulties enough, for instance, may arise in the case of a municipal water system, owing to the damage inflicted on other communities, and it has sometimes been necessary to strain a good many points of the law to carry out such an enterprise. If it should become common for cities to undertake power supply, these questions as to the extraterritorial rights of a municipal organization are bound to come to the front, and we are inclined to think that the courts of last resort will proceed slowly in allowing one municipality for its own gain to strike hard at the prosperity of another.



500,000-Hp. Hydro-Electric Development at Queenston, Ont., as Seen from Airplane

THIS plant, which will ultimately contain nine 45,000-kva. generators, will utilize a 305-ft. head, or nearly the full drop between Lakes Erie and Ontario. The generating station here shown will accommodate two units, one of which is ready to turn over now and is expected to be carrying load early in January. Back of the station may be seen a portion of the canal which brings water 13½ miles from Chippawa, on Lake Erie. Energy will be transmitted at 110,000 volts. More details regarding this important development of the Hydro-Electric Power Commission of Ontario were published on page 697 of the March 26, 1921, ELECTRICAL WORLD.

The Natural Foundation Laws of Service*

A Graphic Presentation of the Reasons for and the Reward of Service Brought Down to the Terms of a Useful, Simple, Human Thought

By LOYAL S. WRIGHT

WE ARE living in the realm of law, not luck. All life is a sequence of law. I hold an object in my hand and suddenly release it. Unless impediments prevent, it will go straight to its attraction—Mother Earth. This is perfectly natural and never varies, never changes. If I step out of my window, sixteen stories above the street, I do not break any law, but the law proceeds to break me. And we use words loosely when we say we break the law, because we don't. It would make no difference if the President of the United States stepped out of my window. The law would likewise break him on the pavement below, because man did not make this law and man cannot break it.

The laws that underlie the principle of service are just as perfect and just as real as the law of attraction, and that men do not recognize this to be true does not alter the facts. Men have been attempting in the past through organizations and individually to break some of these natural laws, and the result has always been the breaking of themselves.

The serving of the public is a subject that has been discussed before many gas and electric conventions by many individuals. Bulletins have been written treating of the effects rather than of the causes, and the reason for the "upside-downness" and the "inside-outness" of business conditions is the simple fact that institutions serving the public have had their eye upon and set their ambitions on effects rather than causes and have failed to take care of the means that naturally lead to the end.

It is perfectly natural for objects to gravitate to the earth. It is no more natural, however, than for the public to gravitate to the concern that renders service. Like attracts like, and this truth is so simple and yet so important that institutions overlook the real issue.

PUBLIC PAYS THE BILLS

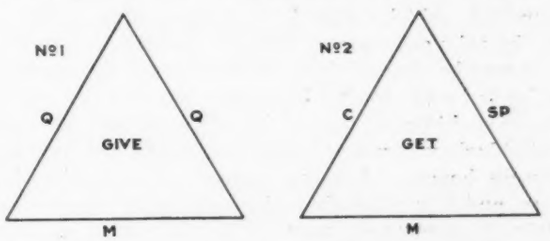
Employers have been trying to see how much they can get and how little they can give. Employees, likewise, have been trying to see how much they can get and how little they can give. The result has been a composite getting without the composite giving, and the public, being human and paying the bills, has felt this condition very keenly, which has resulted in the forming of prejudiced judgments and has torn away some of the concrete of confidence on which the public service corporations must at all times stand.

In other words, the books in the mathematics of life are out of balance. Some such spirit as this might be illustrated in the case of a fellow who appealed to the head of an institution for a job. His first question to the employer was: "How much will you pay me?" The employer replied that he would pay him all that he was worth. The man's answer was: "Nothing doing! I am getting more than that now."

This "principle of service" does not stop with the public service corporations. It is a universal principle—one that applies to the animal world, the vegetable world, the mineral world and even to the banker, and the violation of this principle has and always will mean heavy penalties. Let me illustrate in a simple way the mathematics of life as I see them, by making use of these two triangles:

Triangle No. 1 has for its right side right quantity of work, right quantity of giving. One naturally expects when he pays for service that the right quantity will be delivered, and a safe rule for all individuals connected with business in order to be sure that this side of the triangle is of the right dimension is to do a little more than is absolutely necessary. The left side of the triangle represents right quality of work or service rendered. The base of the triangle represents the mode or manner in which the work is delivered.

To apply this idea in a practical way: A bookkeeper



EQUILATERAL TRIANGLES OF SERVICE AND COMPENSATION

may do all the work that is required of him and even more. He may work long hours, and faithfully, but if the quality of his work is not satisfactory, he is of no particular value to the institution. Again, he may do his work without making any errors, but if he doesn't do enough work, again his value is materially lessened and he cannot render service. Another bookkeeper may be a hard worker, his quantity of work may be right and his quality of work may be right, he makes no mistakes and is thorough in the work he does, but his manner of rendering that service, his mental attitude toward those with whom he works, his habits and so forth, his mode of conduct, may be off. In that event the two other sides of the triangle are killed. In order, therefore, for any individual engaged in human activity to render service he must have right quantity, right quality and right mode of conduct.

I know of a farmer who owns a dairy of high-grade cows, all registered, and while showing a friend of mine through his barn one day the friend observed on the stanchions of different cows letters—Q, Q, M. On some stanchions there was just one, on others there would be two Q's, and so forth. So he asked what they meant, and the farmer explained it in this manner. Pointing to cow No. 1, he said: "Here is a cow that gives a lot of milk. Her quantity is most excellent, but her

*An address delivered before the Empire State Gas and Electric Association at Lake Placid, N. Y., Oct. 7, 1921.

milk is bluer than a whetstone. She tests less than 3 per cent and her quality is off. Therefore, she is going to get it in the neck." To another cow he pointed and said: "Here is a cow that gives the richest milk of all the cows in the barn, but she doesn't give enough milk to pay for the feed she is eating. Her quantity is off, and she," he added, "is going to the slaughter house." They came to a third cow, and my friend asked him about that cow, and he said: "Here is a cow that gives a large quantity of milk and gives very rick milk, but her manner of delivery is rotten, and she is going the same way as the others." And then the dairyman took the friend to still another cow, and approaching her very gently he said: "Here is a cow that is Q, Q, M. She gives enough milk, her milk tests a very high percentage, and her manner is fine." And he added: "I wouldn't take a thousand dollars for her." That cow had a blanket on and was receiving special care from attendants and enjoying life, simply because she was rendering service.

I might go further and show how the same principle applies to the minerals, to vegetation, and so forth. But I think all will recognize that this is a universal principle that cannot safely be violated. So in the center of this first triangle "Q Q M" we put the word "Give."

Triangle No. 2 has for its right side the letters "SP," which mean self-preservation. This is a natural feeling for all individuals, because one of the first thoughts that come to us even in childhood is to preserve and take care of ourselves. The left side of this triangle we will name "C," which stands here for contentment. The base of the triangle we will call "M," which means money.

It may be that all three of these states are essential in order to be successful. One must be contented and must preserve himself. And I have never met very many individuals who were "broke" financially and were exceptionally happy. Therefore money is essential for happiness, and it is perfectly right and proper that we should strive to accumulate money. In the center of this triangle we will place the word "Get."

The Good Book says that the first shall be last and the last shall be first, and it is quite evident that in the attempt to serve the public many institutions and employees have been studying and practicing the teachings of the Good Book, and in the mathematics of life they have put Triangle No. 2 before Triangle No. 1. This is why I say that the books are out of balance. This is why I say that we are violating the great natural foundation law of service when we try to serve the public with the triangles in the wrong place.

Reward for Service

If at any gathering of men representing institutions engaged in commerce I should cause to be passed among the different attendants a slip of paper with this question on it, "Why are you in business?" the chances are that the majority of the replies would be, "To make money," "To make profit," and no doubt this would be a perfectly honest answer. But, as a matter of fact, these men are not in business to make money; they are in business to render service, and money is simply the natural effect, that is, reward for service rendered.

Everybody knows that if he builds a little fire he gets a little heat. If he builds a bigger fire he gets a bigger heat. It is likewise true that if he renders a little service he gets a little reward and if he renders a greater service he gets a greater reward.

Action and reaction are equal, and when gas and electric companies, or other public service companies, come to a realization of this great fundamental truth, the "upside-downness" and the "inside-outness" of things are going to be adjusted. You have got to give in order to get, and the best way that I know to absolutely destroy Triangle No. 2—which is the thing that you desire—is to allow selfishness or the spirit of getting predominate in your life and business.

In order to serve well, the individual or the collective group of individuals must first possess deeply the desire to serve. There is no weak sentimentality about this principle of service. It is a sound economic principle that does not change and cannot be violated without impunity. To the earnest man during these stressful times the only question would be, "How can this be accomplished? How can I so teach myself and also my employees this principle of service that the public may first feel its effect and confidence established in their minds and that our reward may automatically come back to us?" The answer is not easy by any means, and yet this can and should be accomplished.

First Step Is Salesmanship

Millions of dollars have been poured through the gutter of inefficient training. Plans that were valuable have never been carried through because of the lack of co-operation from officials, from heads of departments or from employees. The first step that must be taken is to recognize that it is a question of salesmanship. There are three sales to be made. The first sale is from the employer to the employees in order that the employee may have complete confidence in the institution and may become boosters instead of knockers—may at all times, from the office head down to the line men, speak well of the management. The second sale is the sale by the employees back to the institution in order that the institution, represented by the executives and managers, may have this same confidence in the employees. And the third sale necessary is the composite institution, that is, from president to porter, back to the public. When these three sales are accomplished, you have what I like to call a constructive organization, a solid line-up which becomes practically impregnable. Even then some disloyalty creeps into the institution, but it is very quickly discovered and eliminated because of the general composite condition.

Disloyalty and pessimism cause a great deal of trouble, not only to the individual who is so afflicted, but to the institution in general and to the public. It is true that some individuals are naturally pessimists. On the other hand, it is also true that the majority of human beings are very susceptible to development and may be taught the principle of service and will co-operate in building a real organization when they are properly instructed. It is the duty of every employer to co-operate on some fair basis with the employees, so that they may either hear some competent teacher on this subject or may have pamphlets or material that would teach them in a simple way the mathematics of life. And it should be remembered that this great natural foundation law of service, this law of get and give, is not alone an intellectual accomplishment or a physical accomplishment. It involves the deep-seated heart stuff which is so often lacking in the organization. You can buy heads and you can buy hands, but you cannot buy hearts. But head stuff and hand stuff without heart stuff will never build a constructive organization and an enduring institution.

First 220,000-Volt Station Completed

Construction Records Broken by the Completion of the Big Creek No. 8 Station of the Southern California Edison Company in Three Months—Simplicity of Station Layout a Feature

THE FIRST hydro-electric station to be built for 220,000-volt operation has been completed by the Southern California Edison Company. The station, known as Big Creek No. 8, has one 22,500-kw. vertical reaction turbine in service at the present time and plans are laid for the development of 135,000-kw. The lines are operating at 150,000 volts pending the construction of additional stations in the Big Creek project, at which time the lines will be raised to 220,000 volts. In addition to the high voltage the station is remarkable for the speed with which it was constructed. Excavation of the power-house site was started on March 1, 1921; the first concrete was poured on May 10; the station building was completed and all machinery installed with the exception of the high-tension switches on Aug. 1, and the unit was first turned over on Aug. 7.

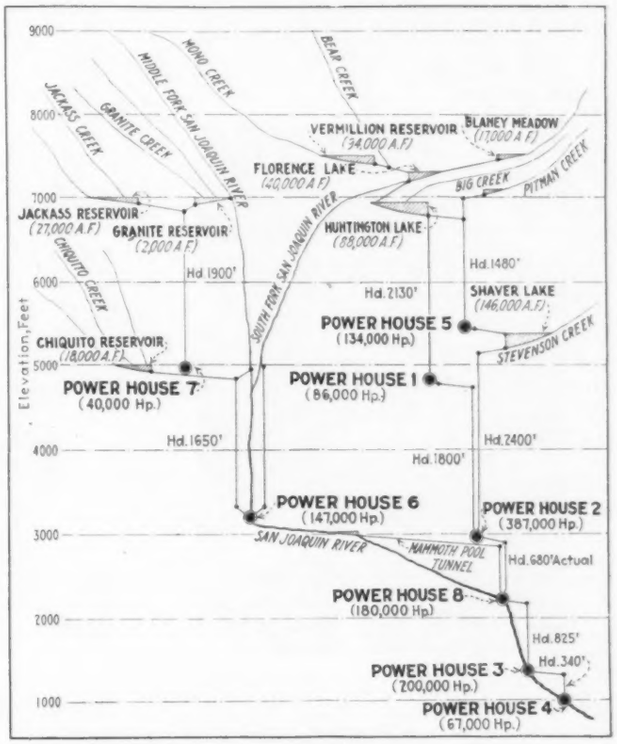
Big Creek No. 8 is the third unit of the Big Creek development of the Southern California Edison Company. A general survey of this development was given in the ELECTRICAL WORLD for Sept. 11, 1920, page 513. Stations No. 1 and No. 2 have been in operation for eight years, transmitting their output at 150,000 volts to Los Angeles, a distance of 240 miles (386 km.) over a two-circuit transmission line. No. 8 station is located at the junction of Big Creek and the San Joaquin River and is about 40 miles (64 km.) northeast of Fresno, Cal. It receives its water at the tailrace of Big Creek No. 2, from which point it is diverted by a low concrete dam through a tunnel approximately 2 miles (3.2 km.) long. The original plans were to carry the tunnel to a point where a head of about 1,500 ft. (450 m.) could be obtained, but these plans were modified owing to the urgency of providing additional power at an early date. Consequently the No. 8 station was designed to utilize 680 ft. (207 m.) of the available head, as this could be quickly done without affecting the total output of the ultimate development.

The selection of 220,000 volts for the transmission voltage was not because of the output of this station alone, but because of the ultimate output of the entire project. The present developed capacity of stations Nos. 1, 2 and 8 is 102,500 kw. The ultimate development of 929,000 kw. is detailed in the accompanying table.

The economical capacity of the two transmission lines to Los Angeles is about 60,000 kw. each at 150,000 volts, so it is evident this limit will be reached soon at the rate additional power is being developed. As the economical capacity of the lines operated at 220,000 volts will be more than double that at 150,000 volts, a great saving in right-of-way and line investment will be effected by the use of the higher voltage. The exact date upon which the line voltage will be increased has not been determined, but it will probably be within eighteen months.

At the outlet of the tunnel a steel surge tank 35 ft. (10.6 m.) in diameter and 90 ft. (27.4 m.) high has been constructed. In addition to taking care of possible surges in the penstock due to the operation of the wicket gates of the turbine, the tank will place the tunnel under pressure. A maximum surge of 70 ft. (21.3 m.) pressure is calculated for the penstock.

The pensfock is connected to the surge tank with an 8-ft. (2.43-m.) coffin-sluice gate placed inside the tank, below which there is a 36-in. (0.9-m.) air-vent pipe extending to the top of the surge chamber. Provisions are made in the surge tank for the connection



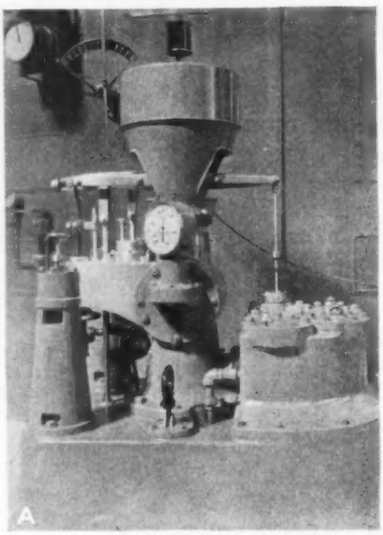
ULTIMATE DEVELOPMENT OF SAN JOAQUIN RIVER

Station No.	Rating, Kw.	Head, Ft.
1	64,000	2,130
2	290,000	1,860–2,400
3	150,000	825
4	50,000	340
5	100,000	1,480
6	110,000	1,650
7	30,000	1,900
8	135,000	680
Total	929,000	10,865–11,005

of two additional penstocks to supply water to units which will be added in the station later.

The upper 700 ft. (213 m.) of the penstock is 8 ft. (2.43 m.) inside diameter, riveted steel pipe, The remaining 2,000 ft. (600 m.) is of welded steel pipe with bumped joints. This type of joint was selected as with it the frictional losses are reduced to a minimum and the pipe is easy of assembly. Five concrete anchors are provided for the penstock, one at each of the angles in the pipe. Midway between anchors expansion joints are placed, principally because the pipe is uncovered. Each of the approximately 19-ft.

Some Interesting Hydraulic and Electrical Parts of Big Creek No. 8 Station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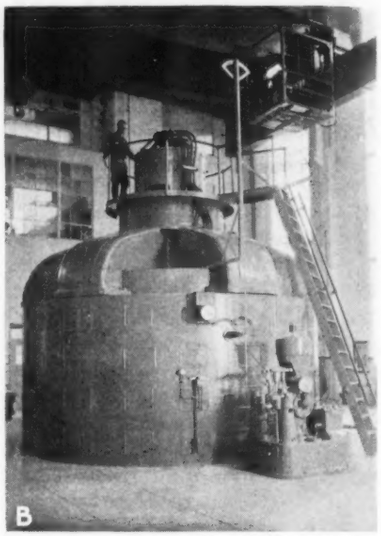
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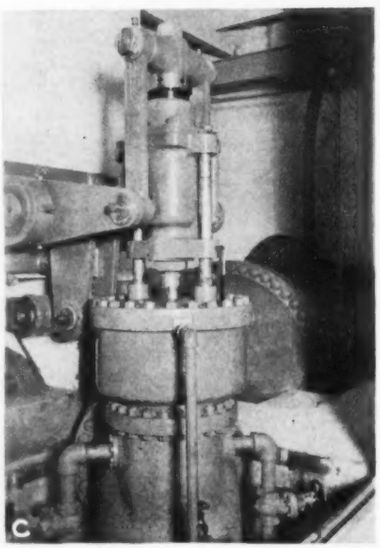
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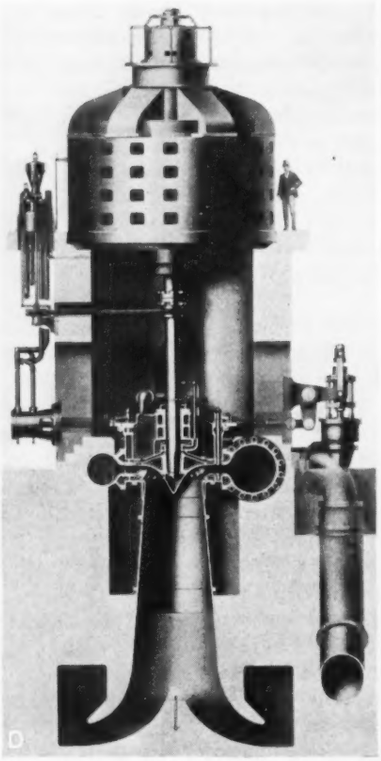
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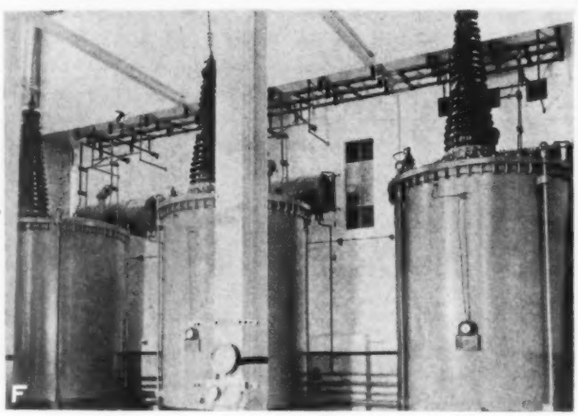
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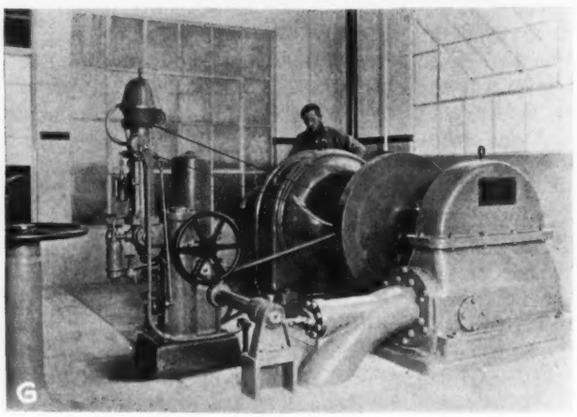

G

A—Waterwheel governor that permits ready change-over from automatic to manual control.

B—22,500-kw., 11,000-volt generator.

C—Release-valve control.

D—Cross-section of a prime mover showing governor on left, release valve on right, waterwheel rotor and draft-head regainer.

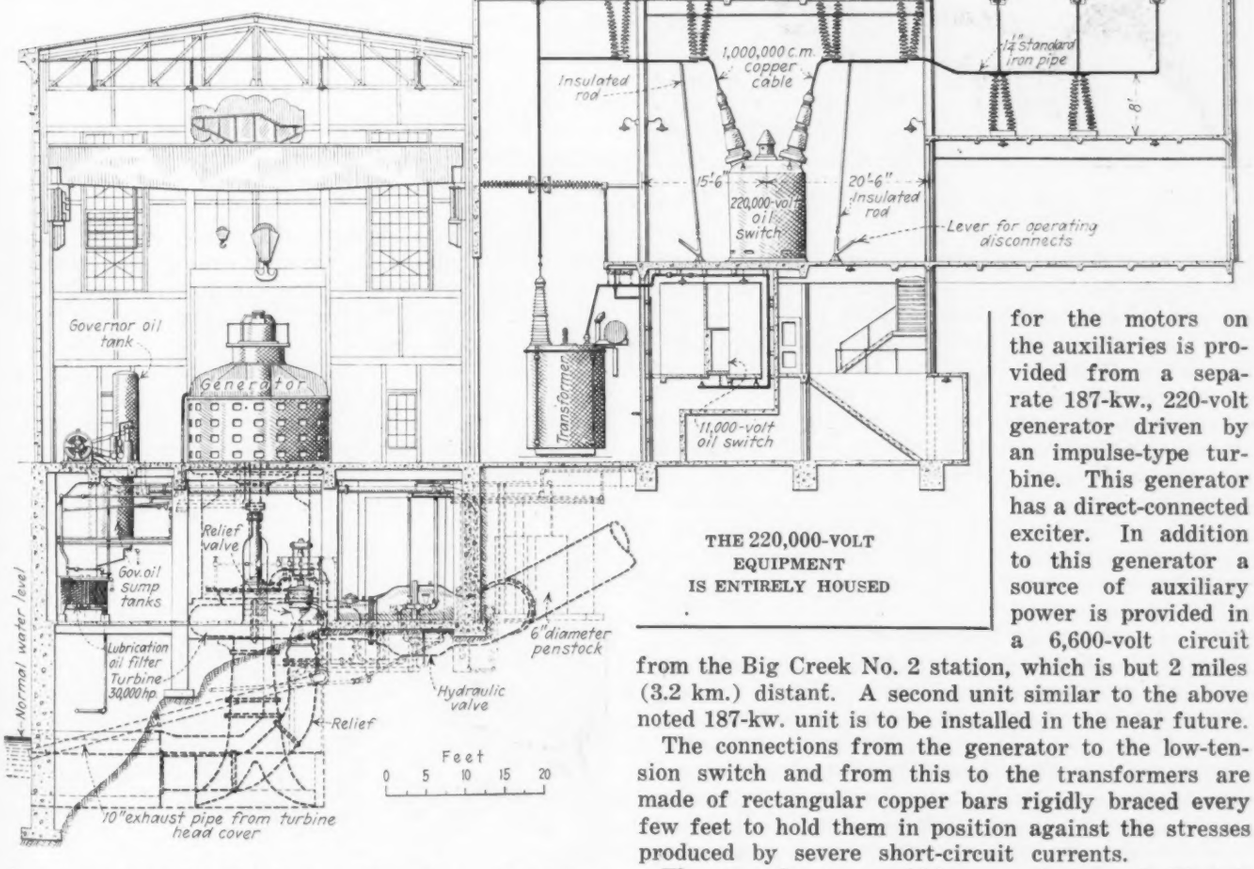
E—First section of main switchboard.

F—220,000-volt transformers are in bay adjacent to generator room. The transformers and the 220,000-volt oil switches constitute particularly interesting parts of this installation.

G—Station power generating set driven by impulse-type waterwheel.

(5.8 m.) sections of the welded portion rests upon a concrete saddle.

At the lower end the penstock is 6 ft. (4.8 m.) in diameter and connects to a Johnson valve having an intake diameter of 6 ft. and a discharge diameter of 4 ft. 6 in. (1.4 m.). This valve is connected to the turbine casing through a cast-steel pipe containing a Y-connection for a relief valve. The relief-valve disk is mechanically connected through a piston rod, heavy link, lever and reach rod to the operating ring of the turbine gates. The turbine, which was built by the I. P. Morris Department of the William Cramp & Sons Ship & Engine Building Company, is designed to develop 30,000 hp. under a 680-ft. (207-m.) head at a speed of 428 r.p.m. It is of the vertical-shaft, single-runner type. The runner is of bronze and is made entirely in one part, including the labyrinth seals. Special guide vanes of the Overn disk type are provided in order to reduce leakage. The draft tube is of the Moody spreading type. The intermediate section of the tube immediately below the runners is made removable in order that the runner may be replaced from below.



THE 220,000-VOLT EQUIPMENT IS ENTIRELY HOUSED

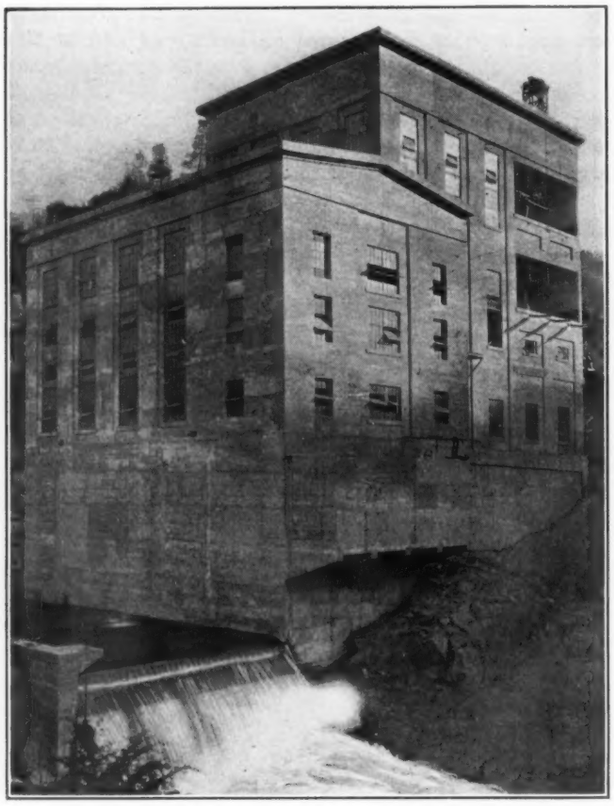
The governor is of the I. P. Morris double floating-lever type furnished with an automatic device known as the Taylor control system. By the use of this system a movement of one hand lever permits a change-over from governor to hand control and thus avoids all danger of a runaway or difficulties due to loss of control of the unit during the change.

The generator was manufactured by the General Electric Company and generates at 11,000 volts. A direct-connected exciter is provided on the upper end of the generator shaft. Between the generator and transformer is connected an oil switch which is to be used primarily for synchronizing, particularly when the later units are installed. A bypass connection is provided around the switch so that it may be worked upon without taking the generator out of service. There is no low-tension bus.

Auxiliary electric power for the station lights and for the motors on the auxiliaries is provided from a separate 187-kw., 220-volt generator driven by an impulse-type turbine. This generator has a direct-connected exciter. In addition to this generator a source of auxiliary power is provided in a 6,600-volt circuit from the Big Creek No. 2 station, which is but 2 miles (3.2 km.) distant. A second unit similar to the above noted 187-kw. unit is to be installed in the near future.

The connections from the generator to the low-tension switch and from this to the transformers are made of rectangular copper bars rigidly braced every few feet to hold them in position against the stresses produced by severe short-circuit currents.

The transformers, which are of General Electric manufacture, are rated at 8,233 kva., 220,000 volts, and involve several new features of construction. The fact that they are to be connected without resistance to a permanently grounded system made possible the attachment of the line terminal to the middle of the coil stack and the attachment of the neutral to the top and bottom of the coil stack. With this arrangement ample creepage distance to ground is obtained along the supporting and insulating cylinders within the dimensions of the coil stack. If the usual construction had been employed with the line end at the top or bottom of the



BIG CREEK NO. 8 STATION IS AT JUNCTION OF BIG CREEK AND SAN JOAQUIN RIVER (BIG CREEK IN LEFT FOREGROUND)

stack, these supporting cylinders would have projected at least 16 in. beyond the coil stack, thus increasing the height of the core about 32 in.

The position of the line terminal attachment necessitates two multiple circuits on each of the two core legs so that enough turns had to be provided for double the rated voltage. Instead of connecting adjacent coils on the same core leg in series, adjacent coils on opposite legs are connected in series, that is, the coils are cross-connected.

The low-voltage winding consists of a helical coil of eight strands wound in multiple, each turn of the coil being separated from the adjacent turn by a generous oil duct. Such construction insures free oil contact with the winding and possesses exceptionally good mechanical characteristics. The spacing between turns corresponds to the spacing between coils in the high-voltage winding, permits the cooling of the heavy conductor in the same manner that the cooling of the high-voltage coils is effected, and prevents local spots of high temperature. This insurance is not jeopardized by the pressboard supporting structure as this is so located that it does not require any heat transmission through it. The circular coil structures on both high-tension and low-tension windings afford excellent mechanical resistance against radial forces, while the steel supporting structure at each end of the coil stacks resists longitudinal forces.

To obtain the necessary radiating surface and substantially circular outline the core was made in five steps. Asbestos-covered heat-resisting core bolts, staggered in location, and core sections separated by sheet asbestos make any high internal temperatures which may accidentally occur perfectly safe. This construction had been previously extensively used and tested in service, the only new features involved being a slight increase in the dimensions over those of the largest similar core structure previously used.

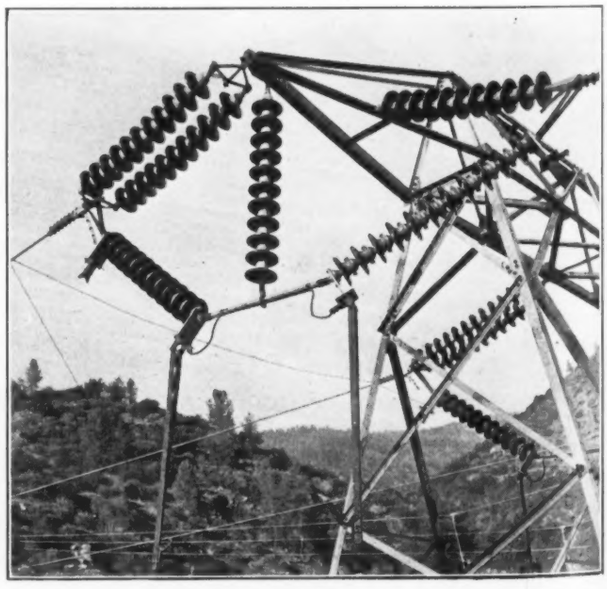
The completely oil-filled tank, of conservator type, which is employed in this make of transformer has been used before and has demonstrated its value and efficiency in protecting or guarding the oil against deterioration.

The high-tension leads (only one being required to each transformer tank) had previously been developed for other requirements. They are of the oil-filled type, which are now available for any voltage above 60,000. The bushings for this transformer were tested at 565,000 volts for one minute. They have a dry arc-over value of 650,000 volts and a wet arc-over value of 485,000 volts.

From the high-tension bushings of the transformers leads are taken to the two 220,000-volt oil switches, which are mounted on separate floors one directly above the other. From the oil switches connection is made to the high-tension buses. These can hardly be termed buses in the usual sense of the word as they are actually a part of the transmission lines. As shown in the wiring diagram, the high-tension wiring is extremely simple, there being no oil switches in the lines themselves. Units to be added later will have oil switches connecting their transformers to the buses in a manner similar to the first units.

The high-tension buses are supported by pillars of unit-type disk insulators arranged in the shape of a tripod. Investigations are being continued as to the proper number of units for use at the ultimate voltage of 220,000. It is expected that some form of shield ring will be placed at the line end of the insulator strings in order to distribute the stress over the line units, but the exact form of these rings has not as yet been determined upon.

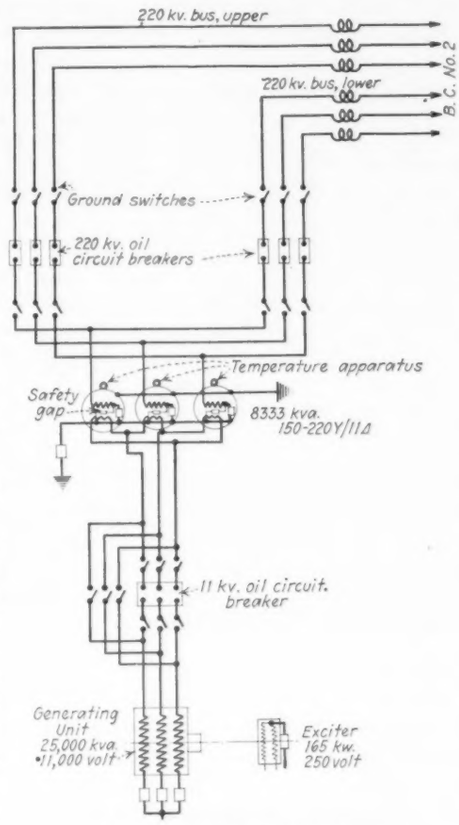
The 220,000-volt oil circuit breakers, which were also furnished by the General Electric Company, are housed in huge cylindrical tanks, one to each phase, and have the largest bushings ever supplied for commercial switches. At their lower ends are explosion chambers which inclose the stationary contacts. The



TWO DISCONNECTING SWITCHES IN SERIES IN EACH PHASE OF 220,000-VOLT LINE

movable contacts for each phase consist of two electrically connected copper plungers, one clamped at each end of a horizontal wooden cross-bar, which in turn is attached to a vertical wooden operating rod guided at two places. This breaker, complete with mechanism and oil, weighs 202,000 lb.

The station building is of steel-frame construction and has reinforced-concrete walls. It consists of two principal portions, one part housing the generator and control equipment and the second housing the switches and bus structure. The latter were placed indoors to protect them from the weather so that any necessary repairs might be carried on most conveniently. One end of the building is sided with galvanized iron in order to provide for future extensions. At the other end of the building the switchboard, offices, pump rooms and supply rooms have been placed. A standard-gage track also enters this end of the building on which future equipment will be brought into the building. A 150-ton (136-metric-ton) crane is installed in the generator room. As the station is at only 2,250 ft. (675 m.) elevation and is built in a box canyon where high summer temperatures are experienced, a humidifier is provided for the generator. Air is taken through this into the turbine floor and exhausted upward through the generator.



SWITCHING AND CONNECTIONS ARE EXTREMELY SIMPLE

On the turbine floor and the one below are vertical pumps for lubricating oil and transformer cooling water and sump water. These are connected to vertical motors placed on the generator floor in order that they may be under the direct observation of the operators. Two motor-driven rotary pumps supply oil to the governor and one impulse waterwheel is provided as an auxiliary to the two motor-driven pumps and may be connected to either of them through a hand-operated clutch.

The material and apparatus for the power house were carried by railroad to a point above the station at an elevation of approximately 5,000 ft. (1,500 m.), whence it was lowered to the station over an inclined cable railway about two miles (3.2 km.) long. The construction was under the direction of E. R. Davis, manager of construction Southern California Edison Company.

System Voltage Raised Without Suspending Service

Old System, Which Was 2,300-Volt, Three-Wire, Changed to 4,000-Volt, Four-Wire, Without Damage or Inconvenience

BY AUSTIN BURT
Manager Citizens' Gas & Electric Company, Waterloo, Iowa

CHANGING from 2,300-volt, three-phase, to 4,000-volt, four-wire, three-phase distribution involves some nice planning if service is not to be seriously interrupted. This task was accomplished at Waterloo, Iowa, without a single instance of personal injury or property damage, and not a single customer was in any way inconvenienced in his service.

The old central station, like Topsy, "just grew" from 433 kw. in engine-driven capacity to 4,600 kw. in turbine-driven capacity, and the original 2,300-volt, three-wire, three-phase distribution system developed with it to supply the demands of a population that increased in seventeen years from 12,000 to 34,000. During this period the number of factories increased from twenty to 150 and the connected motor load from 25 hp. to 6,300 hp.

NEW STATION NECESSARY

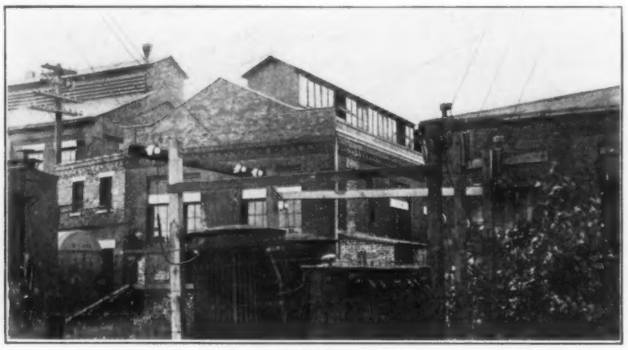
A new and more favorable station location was selected and all-new equipment installed. This gave the opportunity to provide 4,000-volt generators and revamp the inadequate distribution system for 4,000-volt, four-wire operation. The two main problems concerned the lighting and power feeders, minor problems arising with the special installations of a few consumers. There were four 2,300-volt single-phase lighting feeders equipped with Westinghouse induction regulators. In making the change two new four-wire feeders equipped with automatic induction regulators between each phase wire and neutral were run to centers of distribution. The four old circuits were cut to make six. The necessary new wire was run to the distribution center, and the cuts and taps were made to put the single-phase circuits between the new feeder phase wires and the neutral at a time when service would not be interfered with.

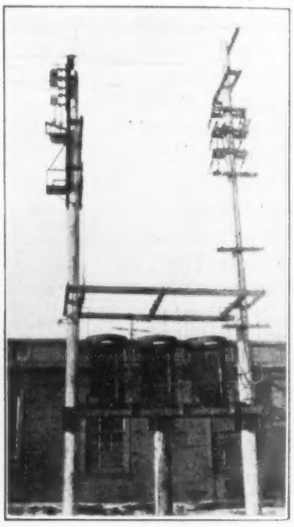
The power circuits, consisting of four 2,300-volt feeders of No. 1/0 copper, were all badly overloaded. The fourth wire was unnecessary as the power transformer banks could be operated with a floating neutral. The delta banks were changed to star connection, and the open-delta banks had one transformer added and the primary connections changed. In these larger problems it will be observed that it was not necessary to supply new equipment except for the tying in of the old circuits to the new station. Although the new station was put in operation on March 1, the old plant was kept running until the change-over of the distribution system was completed on the following July 4, thus keeping the amount of cutover work at any one time to the minimum and avoiding the use of special equipment to keep circuits on which the cut-over was not complete in service.

At one important location the consumer wanted the equivalent of protection found in a delta connection when one of the three transformers burns out. To provide this a near-by neutral wire was extended to his transformer bank so that an open-star connection could

be used in an emergency. Several installations of 2,300-volt motors and motor-generator sets, the latter all office elevator equipments, were handled by installing at the old station two step-down and step-up transformers, rated at 4,000/230 volts and 230/2,300 volts respectively, to maintain 2,300-volt, three-phase service until the necessary rewinding of motors could be completed or replacements made.

The underground system, devised by the writer and in operation about nine years, supplying the business district, consists of four 2,300-volt, single-phase-three-phase, three-wire combination lighting and power feeders with automatic regulators in the lighting phase. The system could not be operated with a star connection and was changed to 4,000 volts and maintained at three-wire delta with new transformers of double capacity and 4,000-volt primaries substituted for the four 2,300-volt transformers.





TRANSITION FROM 2,300 VOLTS TO 4,000 VOLTS MARKED BY CHANGED LINES AND TRANSFORMER CONNECTIONS

Left—New six-pin pole line with old poles not yet removed. Center—Step-down (4,000/230-volt) and step-up (230/2,300-volt) transformers used in making transition. Right—One of the transformer banks which was changed from delta to star connection for 4,000-volt operation.

Two banks of 2,300/33,000-volt transformers serving twenty-eight cities and towns were originally supplied by two 2,300-volt, three-phase circuits. These circuits were changed to four-wire and provision was made for grounding the neutral at time synchronizing is necessary.

NEUTRAL GROUNDING DIFFICULTIES

The arrangement in the station provides for the grounding of each generator through an oil switch, but in operation after the generators are synchronized only one is grounded to avoid flow of the third harmonic current. Attempts to ground the neutral of the lighting circuits near the transformer locations led to serious interference with the 60-cycle ringing circuits of the telephones so this method of grounding had to be discontinued. The neutrals of all overhead lighting circuits are grounded at the station, however. Some difficulty was encountered from the breaking down of transformer bushings by lightning. Single-gap arresters made by shorting all the gaps of old multi-gap arresters were cut in at various points between the neutral and ground, especially at hilly locations, and the trouble disappeared. The lighting-circuit neutral grounds at the station give rise to a total harmonic current varying from 5 amp. to 45 amp. Power feeders are not grounded. The neutrals of the high-tension transformer bank circuits are grounded only when the transformer banks are being synchronized. When connected, the harmonic currents vary from 40 amp. to 70 amp. All secondaries below 440 volts are grounded.

The old multi-gap arresters at the station were replaced by electrolytic arresters, while the old pole-type 2,300-volt arresters were replaced with compression-chamber arresters. Three 2,300-volt single-circuit series incandescent "tubs" on the street lighting were connected to one phase and the neutral wire and operated as before.

OPERATING DIFFICULTIES FEW

The operating difficulties have been few, the most serious being that caused by tree grounds. With the grounded neutral system the slightest contact will cause the relay to operate or burn a wire off. The trouble has been reduced to a minimum by the most vigilant and painstaking tree trimming, though even now a hard rain will bring back the difficulty. It is safe now to say that the lines are free from tree grounds, which is more than could be said of the old three-wire system.

Electric Batteries Reverse Voltage at Low Temperatures

WHEN storage batteries or dry cells are cooled down to minus 170 deg. C., the temperature of liquid air, these producers of electricity may reverse their voltage. This is the scientifically startling phenomenon that has been discovered at the Bureau of Standards, Department of Commerce, by G. W. Vinal and F. W. Altrup, who were making tests to determine the reliability of batteries at arctic temperatures. So far as is known, this is the first time this phenomenon has been observed.

Down to 80 deg. below zero, the voltage remained at the normal value. At about minus 100 deg. C. the voltage dropped down to nothing and then, at a slightly lower temperature, strangely registered a minus reading as high as 10 volts. The voltage fluctuated violently, ranging from positive 10 volts to negative 10 volts. These reversals happened whenever the frozen electrolyte of the cell "ticked."

No hope is held out by the Bureau of Standards that storage batteries can be recharged by the simple method of cooling them to the low temperatures used in the tests. The currents at these low temperatures are vanishing small, and practically they hardly exist.

Experience with Powdered Coal in Arizona

Advantages of This Fuel and the Solution of Some Problems Encountered—Costs Less than Fuel Oil per B.t.u. in This Case—Detailed Costs of Pulverizing Given

By J. B. JOHNSON
Chief Engineer United Verde Copper Company, Clarkdale, Ariz.

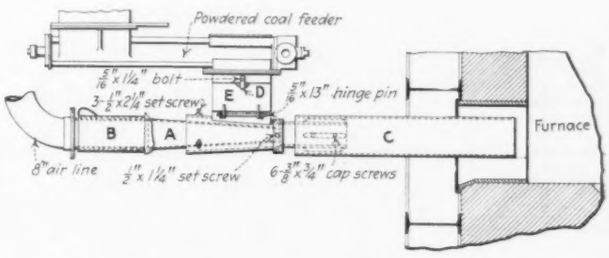
VERY economical generation of steam has been accomplished with powdered coal in the Verde district near Jerome, Arizona. The equipment necessary to obtain the best results and the costs of generation have been carefully studied. Details of the processes and of the plants installed are given in this article, which also contains costs of preparing powdered fuel.

The largest item of expense when installing powdered coal equipment is the cost of the plant for preparing the coal. A plant for this purpose usually consists of the following divisions, named in the order in which the coal passes through them: (1) Storage; (2) coarse crushing; (3) drying; (4) disintegrating; (5) pulverizing, and (6) collecting and conveying to furnaces.

Run-of-mine coal must be crushed before drying so as to break up the lumps to sufficient fineness to liberate the contained moisture during the drying process. The crushing in this stage should make a product not over 1¼ in. (3.18 cm.) nominal size. If the product is too fine, there results a great loss in the dryers due to the escape of "fines" in the dryer uptakes. On the other hand, if the product is too coarse, the moisture will not be sufficiently expelled. The moisture content after drying should not exceed 2 per cent for best results. At the plant of the United Verde Copper Company the moisture runs sometimes as high as 5 per cent without any detrimental results.

After drying the coal is pulverized. As most pulverizers work better on a ¼-in. (6.4-mm.) feed than a coarser feed, it is usually economical to introduce another crushing stage before pulverizing. This reduction is done in disintegrators to about a ¼-in. size. Coal of this size is then fed into the pulverizers, which make a product 80 per cent of which will pass through 200 mesh and 90 per cent through 100 mesh. The separation of the finished coaldust from the pulverizer mills in most modern plants is effected by an upward current of air induced by a powerful exhauster installed above the mill. This method is employed at United Verde. The separation of the dust from the air is later effected by dust collectors of the tangential cyclone type, one primary and a smaller auxiliary being required for each mill. Such separation at this point presents one of the difficult problems in the preparation. When the plant of the United Verde first began operations a muslin tube filter and dust collector was installed, connected by means of a header duct to the vents of all the auxiliary collectors. A vacuum was maintained in this header by means of an exhaust fan beyond the filters. The results obtained in keeping the plant free from dust and preventing dust losses from the main vent were highly satisfactory, but an objection lay in the fact that a header duct was necessary to connect up all the auxiliary collector outlets, thus communicating any fire in the system to this header and to the dust filter. After several fires had burned out the muslin filter tubes this apparatus was disconnected and individual filters were placed over each auxiliary collector. These filters consisted of stacks with baffles and water sprays, the dust caught being washed into a pipe line carrying it back into the main coal-storage plant. This system prevented the communication of fires as it did away with the common header, but allowed considerable dust to escape into the atmosphere.

The ideal result to be obtained is a complete separation of air and dust, but it is more economical to return the greater part of the air to the pulverizer mills, the remainder going to the atmosphere, the dust loss then being confined only to that portion which remains suspended in the air and escapes to the atmosphere. In the Raymond pulverizer mills used at the United Verde about 80 to 85 per cent of the total air handled by the exhauster remains in this closed circuit, returning to the mills in the air downtakes.



POWDERED-FUEL BURNER USED AT CLARKDALE PLANT

Previous to reaching the dryers all lump and slack coal is conveyed on belt conveyors. Out of the storage bunkers the coal is reclaimed by means of a clamshell bucket and gantry crane. The bunkers adjacent to this crane are equipped with bottom gates opening into an underground tunnel in which a belt conveyor runs. A traveling feeder supplies the belt from any gate under which it can be spotted. This belt delivers to the coarse coal crusher, and another similar belt conveyor delivers to the dryer bins from the crusher. The coal from the dryers to the pulverizer mills and the coaldust from the mill collectors to the furnace bins are handled in 14-in. (35.5-cm.) screw conveyors.

The dryer furnaces use powdered coal for fuel, and in conveying the coaldust to these furnaces an air transport system has been in use. Air at 40 lb. (2.8 kg.) pressure shoots the coaldust through a 4-in. (10-cm.) pipe about 150 ft. (45 m.) long. The coaldust is weighed and dropped into a tank into which the air is turned. Dust collectors at the other end of the line collect the dust, releasing the air through a vent in the top. This air transport has given good service. Even bolts and nuts accidentally dropped into the coaldust have been transported through the pipe line with the dust without

injury to the apparatus. The coal fed through this system has averaged 3 tons per day, but the system is good for at least ten times that much.

In conveying coaldust to the furnaces the screw conveyor has been relied upon as the economy of the air transport is doubtful under conditions of heavy tonnages.

As shown in the accompanying table, the cost of pulverizing one ton is $0.98, not including fixed charges. The plant charges also are given in this table.

The coaldust is fed to the furnace burners by means of a small 4-in. double-flight screw feeder with flights at 4⅝-in. (11.6-cm.) pitch. The speed of the screw can be varied from 15 to 100 r.p.m., feeding between 0.22 ton and 1.46 tons per hour. The rate of feed that is most economical varies with air pressure. If the air velocity falls below a certain critical point, the coaldust

COST OF PREPARING POWDERED COAL FOR FUEL

The capacity of the storage bunkers is approximately 13,000 tons of lump coal. The normal capacity of the pulverizing plant is 750 tons per day, with twenty-four hour operation. At this rate of operation, however, the pulverizing plant proper is the only portion that needs to run three eight-hour shifts, the dryers running only two eight-hour shifts. The first costs of the plant, which are shown below, are figured on the above basis of operation. The operating costs, however, as given in the table, are figured from actual operating conditions; that is, an average of 130 tons per day. This condition obtained during the three-month period ended July 1, 1920, which was the period investigated.

OPERATING COSTS

Operation	Operating Cost per Ton
Unloading, storing and reclaiming lump coal	$0.07
Conveying and primary crushing	0.05
Drying and disintegrating	0.30
Pulverizing	0.56
Total	$0.98
Power cost (21 kw.-hr. per ton at 1.5 cents per kilowatt-hour)	$0.32

FIXED CHARGES

	Fixed Charges per Ton at 750 Tons per Day	at 130 Tons per Day
Unloading, storing and reclaiming	$0.08	$0.45
Conveying and primary crushing	.01	.06
Drying and disintegrating	.09	.57
Pulverizing	.14	.80
Fixed charges, total	$0.32	$1.88

FIRST COST OF PLANT

	Per Ton Storage Capacity
Storage and reclaiming plant	$13.00
	Per Ton Daily Capacity
Primary crushing plant	32.00
Drying and disintegrating plant	286.00
Pulverizing plant	403.00

will drop from suspension and obstruct the flow of the mixture into the furnace. For this reason the air duct must be small enough to insure a velocity of at least 110 ft. (33 m.) per second. This can usually be maintained by a pressure of 2 oz. per square inch (8 grams per sq.cm.) inside the burner duct. The question of the proper initial air pressure to use is still unsettled. The problem involved is only one of economy, however, as installations using 90-lb. (6.3-kg.) high-pressure air have been successful. Of course, only a portion of the air necessary for complete oxidation of the fuel is supplied by blowers under high pressure. The coal burners as usually designed are air injectors drawing induced air into the burner tubes along with the coaldust fed into it by the feeders. The air supplied by blowers varies from 20 per cent to 50 per cent of the total. As a general principle it may be stated that the higher the blower pressure the less blower air required. Experience has taught, however, that the highest air economy lies within the range of the low-pressure blowers from 6 oz. to 20 oz. pressure per square inch (26 grams to 88 grams per sq.cm.), and not in the range of the high-pressure compressors. This is due largely to the fact that the type of air injectors most suitable for blowing coaldust are not efficient injectors with high-pressure initial air.

The powdered-coal burners developed at Clarkdale are shown in the accompanying sketch. Blower air is delivered through an 8-in. (20.3-cm.) duct to each burner. Coaldust is fed from the 4-in. (10-cm.) screw overhead through the vertical chute *E* on to the first air nozzle *A*. The first stage of induced air is drawn in around this nozzle and regulated by means of sleeve *B*, which slides back and forth over the pipe. The second stage is induced into the burner pipe *C* after the coaldust has been fed into the air current. The burner pipe contains a fair mixture of powdered fuel and air which is introduced into the furnace through cast-iron burner ports. This mixture acts as a fluid and is under a pressure varying from 3 oz. to 6 oz. per square inch (13 grams to 26 grams per sq.cm.) and contains approximately 85 per cent of the total air necessary for complete combustion. The remainder of the required air is drawn into the furnace through the furnace walls, burner ports, etc.

Powdered-coal burners for steam-boiler application must differ in design very materially from those in use on various types of heating furnaces. Many of the failures of powdered-coal application to boilers can be attributed to ignorance of this fact. The principal point of difference in these designs lies in the fact that boiler burners must be capable of quick and efficient regulation within the limits of a wide range. Boiler furnaces must be specially designed for burning powdered coal to accommodate the removal of slag and ashes. It must be kept in mind that powdered coal contains as much ash as the lump coal from which it was prepared. In a properly designed furnace ashes and slag drain into the ash pit continuously as fast as deposited.

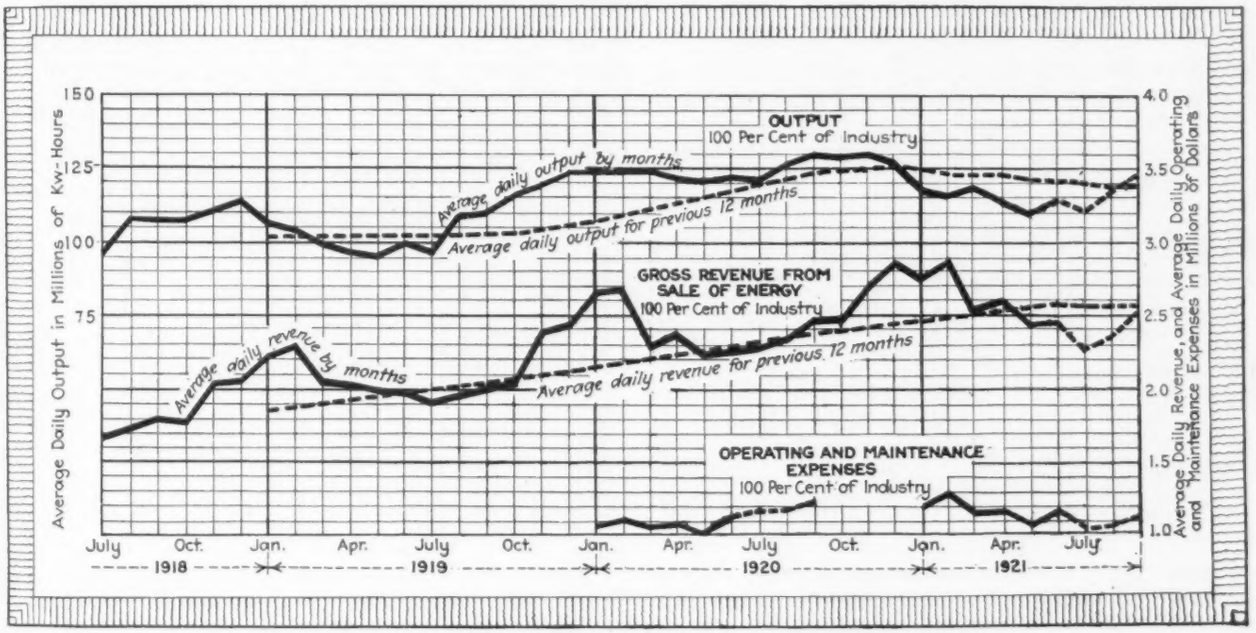
There is no more danger in handling and transporting powdered coal than in handling and transporting gasoline if the same precautions be observed in both cases. Powdered coal will oxidize very rapidly when exposed to the atmosphere owing to the enormous surface exposed by the dust particles; therefore, if allowed to accumulate anywhere inside a building or pulverizer mill and lie for two or three days, the least amount of heat applied will cause it to ignite and burn. Some trouble was caused at the Clarkdale plant from the burning of coaldust inside the pulverizer mills during the early days of the plant operation. This was due to coaldust lodging in one or two places inside the mill after it was shut down. Upon starting up after a day or more idleness this dust would ignite in the current of air drawn through by the exhauster, and it was necessary to flood the mill in order to put the fire out. This trouble has, however, been largely overcome by the ordinary precautions of cleaning out all pockets of accumulated coaldust when the mill is shut down. At Clarkdale as much as 10,000 tons of lump and stack have been stored in the storage bunkers, which are built water tight on the ground, and it has been found necessary to flood the coal almost daily in order to prevent spontaneous fires. The bunker construction and design render this operation very simple, and therefore no trouble from this source has ever been experienced, although the New Mexico coal which is used here is very susceptible to spontaneous fires.

Comparisons of powdered coal with fuel oil must not only take into account the efficiency on a heat basis but

also the expense of preparing the fuel and the fixed charges on the plant. After taking these into account in the United Verde plant, it was found that powdered coal was markedly more economical than oil fuel. The evaporation based on tests at the plant of the United Verde Extension was 6½ lb. of water net per pound of coal. The average coal cost, f.o.b. smelter, Clarkdale, Ariz., in 1920 was $6.10 per ton.

The coal that is used in this district varies in heating value from 10,500 to 11,800 B.t.u. per pound high value, while the California fuel oil which is used here averages 18,000 B.t.u. per pound. To arrive at the total fuel cost it is necessary to add the costs of unloading, storing, and, in the case of oil, pumping, heating and atomizing, and in the case of coal, crushing, drying, pulverizing, conveying and blowing into furnaces.

Energy Output Continues to Increase



CENTRAL-STATION OUTPUT AND GROSS REVENUE INCREASE DURING SEPTEMBER

REPORTS received by the ELECTRICAL WORLD for the month of September from central generating and distributing companies representing 78 per cent of the installed rating of the country indicate that the average daily electrical energy requirements during that month were the largest since December, 1920. A slight general increase in industrial power use and, of course, the advancing lighting requirements, added to the consumption of new customers, explain the increase in average daily output of 4,846,000 kw.-hr. over that reported for August.

From an economic viewpoint the September returns are most encouraging to the electric light and power industry, especially when the industry is compared with other primary industries of the country. The electric light and power industry, while selling 4.3 per cent less electrical energy in September this year than in September, 1920, reported gross revenue from sale of energy 2.1 per cent in excess of that received for September last year. In addition, the operating and maintenance expenses during September were 6.4 per cent below those of September, 1920. From this it is apparent that there has been a considerable increase in the high priced energy consumption, indicating a growing number of domestic customers. When comparing one month with the corresponding month in the year previous sight must not be lost of the added consumption by new customers connected during all the intervening months. While the extent of this growth is not definitely known, the ELECTRICAL WORLD is making a survey the results of which should be available about the first of the year.

The output of electrical energy during September reflected industrial activity about on a par or slightly above that of August, with the exception of the Atlantic States, where an undoubted upward swing in industrial activities is discernible. A seasonal increase in energy consumption for lighting purposes, however, was reported by every section.

Slightly increased operations were reported by the textile mills in New England during September, and virtually all the paper mills were opened during the month after a prolonged strike. The other primary industries of this section were operating at about the same capacity as during August. These slight increases in industrial requirements, augmented by an increased lighting load, and new lighting and industrial customers, resulted in an average daily electrical output of 850,000 kw.-hr. in excess of that reported for August.

In the Middle Atlantic States the first sign of general industrial improvement was reported in August, and a very gradual increase in industrial operation continued in September. The coal mines in the western part of the section increased production, and textile mills and clothing factories continued slowly to approach normal.

TABLE I—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

	Month	Percentage of Installed Ratings Represented	New England States 1920 Thousands	New England States 1919 Thousands	New England States Per Cent Increase	Percentage of Installed Ratings Represented	Atlantic States 1920 Thousands	Atlantic States 1919 Thousands	Atlantic States Per Cent Increase	Percentage of Installed Ratings Represented	North Central States 1920 Thousands	North Central States 1919 Thousands	North Central States Per Cent Increase	Percentage of Installed Ratings Represented	South Central States 1920 Thousands	South Central States 1919 Thousands	South Central States Per Cent Increase	Percentage of Installed Ratings Represented	Pacific and Mountain States 1920 Thousands	Pacific and Mountain States 1919 Thousands	Pacific and Mountain States Per Cent Increase
KW.-HR. OUTPUT	Oct.	82	196,310	191,132	2.7	66	964,739	841,694	14.5	74	896,241	817,757	9.5	56	157,267	126,769	24.1	79	583,068	522,136	11.7
	Nov.	82	193,231	183,624	5.4	66	953,436	825,011	15.5	74	895,229	861,352	10.5	56	144,889	125,438	15.0	79	554,920	507,977	9.2
	Dec.	82	210,494	227,403	-7.4	66	969,909	917,945	5.7	74	903,628	852,264	5.9	56	140,485	133,419	5.3	79	568,038	517,715	9.6
			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	Jan.	81	200,269	247,800	-19.2	77	1,003,223	1,043,650	-3.9	73	860,643	956,078	-10.0	62	144,936	145,336	-0.3	81	556,561	550,685	1.1
	Feb.	81	178,694	216,890	-17.6	77	902,030	970,539	-7.0	73	789,539	882,873	-10.6	63	131,654	132,537	-0.7	81	451,754	508,961	-11.2
	Mar.	81	205,348	230,309	-10.8	79	1,029,120	1,119,428	-8.1	73	894,500	941,893	-5.0	63	139,381	136,017	2.4	81	538,260	561,934	-4.2
	April.	81	196,680	227,008	-13.3	79	963,659	1,052,716	-8.4	73	828,457	894,028	-7.3	63	132,075	135,421	-2.5	88	555,048	586,894	-5.4
	May.	82	191,141	219,298	-12.8	79	934,973	989,408	-5.5	73	819,506	899,657	-8.9	63	136,573	138,416	-1.3	89	586,264	642,495	-8.7
	June.	82	192,007	219,476	-12.5	79	940,443	1,003,727	-6.3	73	806,270	880,934	-8.5	63	136,011	129,120	5.3	89	611,128	639,637	-4.5
	July.	81	187,622	218,995	-14.3	79	934,822	1,026,390	-8.9	73	804,009	884,572	-9.1	64	140,795	141,450	-0.6	89	639,768	678,725	-5.7
	Aug.	81	205,351	224,324	-8.5	79	993,427	1,040,158	-4.5	73	848,509	920,353	-7.8	64	147,967	154,353	-4.1	89	644,696	685,916	-6.1
	Sept.	81	216,783	223,270	-2.9	79	1,008,301	1,052,557	-4.2	73	852,406	895,571	-4.8	64	149,017	149,415	-0.3	89	634,101	670,138	-5.4
			1920	1919			1920	1919			1920	1919			1920	1919			1920	1919	
REVENUE	Oct.	82	$5,675	$4,623	22.7	65	$19,201	$15,722	22.0	57	$14,458	$11,667	23.9	54	$3,504	$2,551	37.3	79	$8,532	$6,492	31.5
	Nov.	82	5,898	5,017	17.5	65	20,938	17,119	22.2	57	15,158	12,561	20.8	54	3,853	2,910	32.4	79	8,775	7,104	23.5
	Dec.	82	6,548	5,744	14.0	65	22,332	19,149	16.7	57	16,004	13,142	21.8	54	3,722	3,113	19.8	79	9,091	7,432	22.3
			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	Jan.	81	6,379	6,170	3.5	74	22,180	19,225	15.3	59	16,818	14,436	17.3	62	4,155	3,484	19.3	81	9,323	7,546	23.6
	Feb.	81	5,925	5,728	3.4	74	21,492	18,327	17.4	59	15,971	14,070	13.6	62	3,915	3,329	17.6	81	8,237	7,179	14.7
	Mar.	81	5,784	5,566	3.8	76	21,822	18,934	15.3	59	15,853	14,103	12.4	63	3,747	3,246	15.5	81	8,307	7,222	15.0
	April.	81	5,665	5,554	2.0	76	21,504	18,609	15.8	60	15,506	13,822	12.2	63	3,744	3,312	13.2	88	8,817	7,767	13.6
	May.	82	5,362	5,342	0.4	76	20,795	17,613	18.0	60	14,866	13,558	9.8	63	3,516	3,179	10.7	89	9,362	8,240	13.7
	June.	82	5,285	5,397	-2.4	76	20,058	17,438	15.0	60	14,485	13,519	7.1	63	3,536	3,152	12.2	89	9,021	8,439	6.9
	July.	81	5,180	5,121	1.1	76	18,798	17,155	9.2	60	14,158	14,689	-3.6	63	3,509	3,145	11.3	89	9,101	8,733	4.3
	Aug.	81	5,297	5,483	-3.3	76	19,168	17,789	7.9	60	14,543	14,586	-0.2	63	3,612	3,536	2.2	89	9,507	9,309	2.2
	Sept.	81	5,661	5,857	-3.3	76	20,113	18,708	7.4	60	15,147	15,593	-2.9	63	3,850	3,565	8.1	89	9,638	9,558	0.8
OPERATING EXPENSES:			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	Jan.	34	$1,098	$1,288	-14.7	48	$6,373	$5,411	17.8	28	$3,941	$3,451	14.2	37	$1,015	$905	12.2	54	$2,135	$2,030	5.2
	Feb.	35	1,069	1,242	-13.9	53	6,799	5,937	14.5	29	3,958	3,445	14.8	44	1,217	1,053	15.5	55	2,042	1,963	3.9
	Mar.	45	1,576	1,651	-4.5	59	7,969	7,241	10.0	35	4,570	4,228	8.2	51	1,776	1,514	17.2	79	2,866	2,614	9.7
	April.	45	1,418	1,479	-4.1	59	7,590	7,168	5.9	36	4,347	4,112	5.7	51	1,567	1,403	11.6	79	2,893	2,479	16.8
	May.	48	1,548	1,577	-1.8	56	6,921	6,660	4.0	37	4,274	4,292	-0.4	52	1,563	1,486	5.2	81	2,969	2,713	9.5
	June.	46	1,737	1,862	-6.7	56	6,916	6,878	-0.5	39	4,843	5,152	-5.9	60	1,835	1,678	9.4	83	3,565	3,519	1.3
	July.	47	1,712	2,077	-17.6	53	6,772	7,111	-4.8	39	4,940	5,800	-14.8	62	1,870	2,039	-8.2	83	3,339	3,937	-15.1
	Aug.	48	1,861	2,088	-10.8	53	6,402	6,611	-3.1	39	5,028	5,793	-13.2	62	1,892	2,003	-5.5	88	3,648	3,884	-6.0
	Sept.	49	1,994	2,191	-8.9	54	6,366	6,774	-6.0	40	5,405	5,589	-3.2	63	1,921	2,057	-6.6	88	3,498	3,992	-12.3

Although improvement was generally noted in the steel and iron industries, it had not progressed to the point of calling for large quantities of additional electrical energy.

In the South Atlantic States reports from all sources and covering almost all industries in this section showed decided improvement and a distinct increase in industrial activities. The drought in this section continued during the month, resulting in largely reduced production of energy by hydro-electric plants and the continued operation of all available steam auxiliary plants.

Taking the Atlantic Section as a whole, the increase in industrial requirements, in conjunction with the increased consumption of electrical energy for lighting

TABLE II—AGGREGATE OPERATING RATIO OF COMPANIES REPORTING DATA MONTHLY TO THE "ELECTRICAL WORLD"

Type of Generating Plant and Month	New England States 1921	New England States 1920	New England States Average for Year 1921	New England States Average for Year 1920	Atlantic States 1921	Atlantic States 1920	Atlantic States Average for Year 1921	Atlantic States Average for Year 1920	North Central States 1921	North Central States 1920	North Central States Average for Year 1921	North Central States Average for Year 1920	South Central States 1921	South Central States 1920	South Central States Average for Year 1921	South Central States Average for Year 1920	Mountain and Pacific States 1921	Mountain and Pacific States 1920	Mountain and Pacific States Average for Year 1921	Mountain and Pacific States Average for Year 1920
Steam Plants:																				
January	54.0	60.8	54.0	60.8	53.5	50.9	53.5	50.9	61.2	61.8	61.2	61.8	53.1	53.7	53.1	53.7	69.0	60.5	69.0	60.5
February	54.3	59.5	54.2	60.3	52.3	53.0	52.7	52.1	63.0	57.9	62.1	59.8	59.1	51.2	56.2	52.3	60.2	60.3	64.3	60.3
March	64.0	70.0	56.7	62.5	54.5	56.7	53.3	53.7	58.4	59.7	60.8	59.8	53.3	50.9	55.0	51.9	68.4	62.5	65.9	61.2
April	59.4	63.5	57.3	62.7	50.9	54.3	52.8	53.8	54.8	61.2	59.3	60.2	54.1	52.8	54.7	52.1	53.7	53.7	61.8	58.6
May	63.2	69.1	58.3	63.8	56.2	58.6	53.4	54.5	54.7	63.3	58.5	60.8	53.3	56.0	54.4	53.0	55.0	57.0	59.9	58.3
June	60.1	71.2	58.7	64.9	55.8	59.5	53.8	55.3	56.6	68.3	58.3	61.8	55.3	60.0	54.6	53.8	53.4	56.2	58.6	57.8
July	60.7	77.3	59.0	66.7	57.2	62.7	54.1	56.1	56.9	70.6	58.1	63.0	55.1	62.4	54.7	55.3	53.3	59.3	57.8	58.0
August	67.3	72.3	60.1	67.3	55.8	61.3	54.2	56.6	56.0	70.0	57.8	63.9	53.3	57.3	54.3	55.7	51.8	59.8	57.0	58.3
September	57.7	71.2	59.8	68.1	52.7	59.4	54.1	56.8	56.9	60.3	57.8	63.6	52.9	60.3	54.2	56.1	46.2	55.7	55.8	57.9
Hydro Plants:																				
January	26.5	35.2	26.5	35.2	21.2	21.2	21.2	21.2	25.0	20.8	25.0	20.8	26.4	20.1	26.4	20.1	27.5	27.3	27.5	27.3
February	30.1	46.5	26.8	35.6	20.1	20.6	20.7	20.9	24.1	20.6	24.6	20.6	28.6	21.4	27.4	20.5	23.9	27.9	26.0	27.6
March	29.9	30.0	26.9	35.3	21.0	20.6	20.8	20.8	23.0	20.6	23.5	20.6	30.4	23.2	28.4	21.3	24.9	19.0	25.8	25.6
April	24.6	34.7	26.5	35.2	18.2	18.8	20.2	20.3	24.8	20.8	24.2	20.7	22.4	25.0	26.8	21.2	27.3	19.2	26.0	24.2
May	26.5	25.6	26.5	34.3	15.5	17.4	19.2	19.7	21.5	20.1	22.5	20.5	27.9	21.2	27.1	21.2	29.8	22.9	26.6	24.0
June	29.2	21.5	26.6	33.8	17.6	18.8	19.0	19.6	21.1	19.5	22.8	20.2	27.3	18.3	27.1	20.7	30.3	27.4	27.6	24.2
July	29.2	29.6	26.6	33.9	15.9	21.1	18.6	19.8	19.4	19.7	22.3	20.2	27.3	18.3	27.7	20.7	24.2	19.9	26.3	25.7
August	31.4	36.5	26.8	33.9	16.7	20.9	18.3	19.8	20.7	21.6	22.0	20.4	33.7	23.1	28.5	21.0	25.1	24.3	26.2	23.6
September	31.4	32.2	26.8	33.4	16.0	19.9	18.1	19.9	20.8	21.1	21.9	48.7	27.6	20.2	28.4	20.9	23.4	22.8	25.9	23.6
Combined Systems of Steam and Hydro Plants:																				
January	45.3	53.5	45.3	53.5	43.5	45.8	43.5	45.8	39.5	38.6	39.5	38.6	38.6	46.6	38.6	46.6	35.2	45.6	35.2	45.5
February	44.3	60.0	44.7	58.8	41.8	41.9	42.6	43.8	42.4	49.8	41.9	48.2	41.7	39.6	40.5	42.0	39.6	43.8	37.4	44.7
March	49.7	53.8	47.3	56.0	39.7	47.3	42.0	45.3	41.5	46.0	41.8	47.3	38.6	39.2	40.2	41.2	36.4	39.7	36.9	43.0
April	46.6	48.5	47.1	53.5	42.9	43.9	41.9	44.8	45.0	48.3	42.7	47.5	43.6	48.6	40.7	42.8	37.0	36.8	37.0	41.0
May	49.2	48.5	47.6	52.3	39.8	44.2	41.4	44.7	47.0	52.8	43.7	48.8	40.7	39.6	40.6	42.2	35.0	38.3	36.4	40.3
June	58.5	56.5	49.6	53.2	42.3	45.8	41.6	44.9	50.1	62.2	45.0	51.6	45.1	44.8	41.3	42.7	38.8	44.3	37.0	41.1
July	56.1	63.2	50.5	54.7	42.6	51.3	41.7	45.8	51.6	64.4	46.0	53.9	53.6	45.3	41.4	42.8	35.4	43.1	36.8	41.5
August	60.6	62.7	51.9	55.8	46.5	49.0	42.3	46.2	51.2	64.5	46.6	55.5	45.3	50.0	41.9	43.8	36.8	43.5	36.7	41.8
September	62.9	65.5	53.4	57.3	47.4	50.6	42.9	46.7	51.2	62.6	46.9	56.3	45.0	47.3	42.2	44.2	38.3	47.7	36.9	42.5

purposes and new domestic and industrial customers, resulted in an average daily central-station output of 42,500,000 kw.-hr.. which is about 2,000,000 kw.-hr. in excess of that reported during August.

The iron and steel industry, textiles and leather and shoe factories in the North Central States reported slightly increased activities during September, and the wheat belt continued to report capacity operations in the mills of that section. These slight but significant increases in energy requirements plus the seasonal increase in lighting requirements and new customers were sufficient to raise the average daily energy output of the North Central States by about 1,400,000 kw.-hr.

In the aggregate, industrial conditions in the South Central States during September were on a par with those of August. The increased lighting load and new customers plus a slightly increased energy demand by the lumber industry probably account for the small increase in the central-station output above that reported for August.

Manufacturing plants in the Mountain States called for about the same amount of electrical energy during September as during August, but metal mining fell to a lower ebb than at any previous time during the year. In the Pacific Northwest industry appeared at a standstill, and similar conditions prevailed in California. The central-station irrigation load decreased with the advancing season. As a result of these adverse conditions and notwithstanding a substantial increase in lighting requirements and new customers, the Mountain-Pacific section as a whole reported only a small increase in output over August. The gross revenue was $75,600,000, and the total operating expenses were $34,900,000. These figures indicate an increase of $1,600,000 in gross revenue and a decrease of $2,400,000 in operating expenses compared with September, 1920.

TABLE III—CENTRAL-STATION RETURNS FOR TWELVE MONTHS

	Percentage of Installed Ratings Represented	Kw.-Hr. Output (Companies Reporting) 1920 Thousands	1919 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	Revenue from the Sale of Energy (Companies Reporting) 1920 Thousands	1919 Thousands	Per Cent Increase
Oct.	71	2,797,625	2,499,488	11.9	66	$51,370	$41,055	25.1
Nov.	71	2,741,705	2,503,402	9.6	66	54,620	44,711	22.0
Dec.	71	2,792,554	2,648,746	5.4	66	57,697	48,580	18.6
		1921	1920			1921	1920	
Jan.	76	2,765,632	2,943,349	−6.0	70	58,855	50,861	15.8
Feb.	76	2,453,671	2,711,800	−9.4	70	55,540	48,633	14.3
Mar.	77	2,806,609	2,989,581	−6.1	72	55,513	49,071	13.3
April	78	2,675,949	2,895,067	−7.0	72	55,326	49,064	12.8
May	78	2,668,457	2,889,174	−7.6	72	53,901	47,932	12.6
June	78	2,686,479	2,872,900	−6.4	72	52,385	47,977	9.3
July	78*	2,706,016	2,949,132	−8.2	72*	50,747	49,195	3.4
Aug.	78†	2,839,950	3,025,104	−6.1	72†	52,127	50,703	2.9
Sept.	78‡	2,860,608	2,990,951	−4.3	72‡	54,409	53,281	2.1

	Percentage of Installed Ratings Represented	Operating and Maintenance Expenses (Companies reporting) 1921 Thousands of Dollars	1920 Thousands of Dollars	Per Cent Increase	OPERATING RATIO Steam Plants 1921	1920	Hydro Plants 1921	1920	Combined Systems of Steam and Hydro 1921	1920
Jan.	40	14,562	13,085	11.3	56.1	55.3	26.8	27.0	38.1	45.6
Feb.	43	15,085	13,640	10.5	55.6	54.5	22.9	26.0	44.1	47.3
Mar.	53	18,757	17,248	8.7	56.1	57.7	23.4	19.6	40.2	44.8
April	53	17,815	16,641	7.1	53.0	56.5	23.9	19.8	41.4	43.3
May	53	17,274	16,727	3.1	55.4	56.8	24.2	22.9	40.6	44.8
June	54	18,836	19,089	−1.3	56.2	62.5	20.4	21.6	45.0	50.9
July	54	18,633	20,964	−11.1	56.8	65.9	20.6	20.2	43.0	52.6
Aug.	55	18,832	20,380	−7.6	56.2	63.8	22.3	22.2	44.5	52.3
Sept.	55	19,184	20,503	−6.4	54.1	60.3	20.8	22.1	47.3	54.7

*Includes estimates for 27 companies, representing 3.6 per cent of the total installed rating of all central stations.
†Includes estimates for 38 companies, representing 6.5 per cent of the total installed rating of all central stations.
‡Includes estimates for 76 companies, representing 17.1 per cent of the total installed rating of all central stations.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Some Aspects of the Superpower Project

To the Editors of the ELECTRICAL WORLD:

The report emanating from the United States Geological Survey and made by a group of distinguished engineers headed by W. S. Murray which deals with the so-called superpower project brings before the public a tremendously interesting collection of data regarding the things which might be done to gain a better co-ordinated power supply. Personally I have preached networks and big transmission work for a good many years, and it is gratifying to see some of the larger projects gradually taking form. In connection with this report, without in the least wishing to offer adverse criticism, I want to call attention to some features which might advantageously be stressed in the interest of a wider project and a further view of the possibilities of the present situation.

No time was ever more uncertain as a basis of forecast than the present year, coming at the end of a desperate period of world inflation, when all nations have joined hands in a financial debauch. It would take nothing short of an officially accredited prophet to say what the demand for electrical energy will be ten years from now. Extrapolation is always a hazardous procedure, particularly when the part of the curve from and beyond which fancy must take its flight is notoriously abnormal in the values shown. Certainly I hope that thirty-odd billion kilowatt-hours for the output of the electrical utilities in 1930 is conservative, but curves have a nasty way of becoming asymptotic, and I fear it is going to be somewhat difficult to persuade the financial world to bet something around a billion dollars on the course this particular curve is going to take.

Broadly, the whole question of this superpower system, with its great possibilities for good, is not one of engineering but of sheer finance. None of us who have been brought up in the power transmission game would hesitate at the voltages suggested, the distances which must be covered or the kind of distribution to be undertaken. The question of who is to pay the bills, however, looms large. Possibly the beginning may come by two or three large utilities making a start purely for their own benefit. Eventually others might join and the project grow to something like full dimensions.

Such part of the hypothetical load as may come from the electrification of railways looks particularly dubious from the financial standpoint. There may be some roads which could, practically, get away with an equipment bond issue of $30,000 per mile, which is the sum suggested, despite their underlying securities; but I doubt whether these roads are numerous or whether they cover more than a small fraction of the 19,000 miles of trackage set out in this report.

Finance rather than engineering difficulties will determine the feasibility of the whole affair, but the thing

to which I desire to call attention, as an old power transmission engineer, is the need of looking forward to still larger things and of having the broadest aspects of the whole affair thoroughly investigated before anything involving great expense shall be undertaken.

The hydraulic resources ought to be very completely cataloged and considered before the grand strategy of the affair is determined. For what is most needed is to cut down the coal consumption, good, bad and indifferent, at once, before the evil hour comes in which the cost of coal will bear hard not only on the manufacturer but on the very existence of the population of manufacturing districts. Unless definite endeavor is made to check the waste of fuel the next generation is going to see a very grave situation. Not that the coal supply will run out, for if one were to figure down to the last deep-sunken vein, the time that must elapse before its exhaustion would run into several centuries; but we have had sufficient evidence of the effect on price of even a minor shortage of coal to show beyond any question that a comparatively small additional difficulty of mining or transportation will mean increase of price sufficient to bear hard on any center of population lying north of latitude 30 deg. or thereabouts.

We are the only nation in the world which uses anthracite for domestic heating purposes to any considerable extent, and anthracite is already going the way of the cannel coal which our grandfathers burned in their grates. To an onlooker it seems therefore that the first line of attack on the whole superpower situation should be via the hydraulic resources, from the Long Sault to the Potomac. The former is credited with nearly 1,500,000 hp. developable at entirely feasible cost, the latter with 200,000 hp., somewhat expensive, but near its market. There is another 1,500,000 hp. on the St. Lawrence, besides all that might be developed at Niagara by a proper international agreement, and sooner or later an international agreement must come. North of the St. Lawrence lies again a region of great hydraulic possibilities, not out of reach of our Eastern manufacturing districts and which our Canadian neighbors might profitably exploit. It may be that these big developments will have to be undertaken under an international agreement at government expense, but they are fundamental to stopping the inroads on our coal supply.

LOUIS BELL,
Consulting Engineer.

Boston, Mass.

Kelvin's Law and the Determination of Economical Type of Transmission Line

To the Editors of the ELECTRICAL WORLD:

Having read with interest the excellent article in the ELECTRICAL WORLD of Sept. 24 describing the new transmission line of the San Joaquin Light & Power Corporation, I venture to offer a little friendly criticism on a feature that may deserve some comment.

Kelvin's law is based on the assumption that the fixed charges on the conductor are proportional to the sectional area (A) and are therefore equal to K_1A and that the cost of the energy loss is inversely proportional to the sectional area and therefore equal to K_2A, K_1 and K_2 being constants. We then have the total cost over any period of time (usually taken as one year):

$$C = K_1A + (K_2/A).$$

Taking the first derivative and equating to zero gives:

$$dC/dA = K_1 - (K_2/A^2) = 0.$$

This is a minimum value of C, since the second derivative is seen to be positive. Transposing and multiplying by A gives $K_1A = K_2/A$, which is the condition for minimum total cost during any period of time.

Therefore the assumption that a certain design is the most economical because the total of the fixed charges, including various classes of plant, is equal to the cost of the energy loss, is not a correct one. It is quite possible in such a case that some other design for which the annual charges on the conductor and its supports are less or greater than the cost of the losses may have a smaller annual cost, including the losses, than the one selected. A strict statement of Kelvin's law is that if all expense proportional to the sectional area (or weight) of the conductor be added to the resistance losses, the sum is a minimum when the two components are equal to each other. If the annual charges include any expense not proportioned to conductor weight, such as poles or line expense, or if the loss cost includes items such as corona, other than the K_2/A loss, Kelvin's law evidently does not apply and may lead to the selection of an uneconomical line.

For the above reasons the only reliable method is to compute for a given amount of power transmitted the actual cost of transmission, including all plant charges and the cost of all losses, for various sizes of conductor. If these values are plotted with transmission cost as abscissas and conductor size as ordinates, the most economical conductor and type of line will be shown by the point of tangency of the curve with a vertical line, or, in other words, by its nearest approach to the Y axis.

E. S. THAYER.

Seattle, Wash.

To the Editors of the ELECTRICAL WORLD:

I have read the letter of E. S. Thayer regarding the article in the ELECTRICAL WORLD of Sept. 24, 1921, describing the 110-kv. transmission line of the San Joaquin Light & Power Corporation. Criticism is raised concerning the method of determining the most economical type of line, and the last paragraph of the letter sums up a proposed method for such determination. This method is exactly the one used in the case of the line described in the article, though possibly it has been stated somewhat differently. In the second column of page 614 of the article I stated my views in regard to the items to be included in finding the annual cost of a line built under the conditions of this one. The curves of annual charges shown at the beginning of the article include 15 per cent on all plant costs, and if to them be added the values shown as the costs of losses at the various loads, the total annual costs of transmission are obtained. In other words, the total installed cost of one mile of line was taken in the case of each size of conductor. The method used was similar to the one shown on page 51 of Still's "Electric Power Transmission," second edition. However, as already noted above and in the article in the ELECTRICAL WORLD, annual charges are on total cost of line instead of on the conductor alone as in Professor Still's method.

An inspection of the curves will show that the lowest annual cost occurs at the point of crossing of the curves, except at some of the very low loads. Kelvin's law really was not applied in its strict sense and probably should not have been mentioned, except to say that it should not be used without the modifications noted both by Mr. Thayer and the article of Sept. 24.

L. J. MOORE,
Executive Engineer.

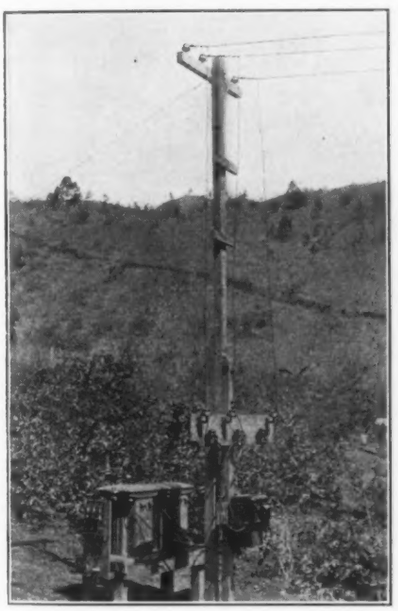
San Joaquin Light & Power Corp.,
Fresno, Cal.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Welding a Penstock in the Field

TO REPAIR a 20-in. penstock in the field by welding it was found necessary by the writer to use part of the transmission system to supply the required voltage for the arc-welding outfit. This penstock, connected with a 700-kw. hydro-electric plant, after about twelve years of service began to develop thin sections and holes. A portable electric arc-welding machine used about the mill and mine being available, it was decided to repair the entire penstock by welding on sections where necessary. The welding outfit consists of a motor-generator set mounted on a truck, the motor designed for operation on three-phase and 110 volts. The nearest three-phase, 110-volt service being at the mill more than 2 miles from the penstock, some other source had to be found.



TEMPORARY TRANSFORMER STATION FOR CONNECTING WELDING MACHINE TO 2,200-VOLT LINE

As the transmission line running near the penstock operates at 6,600 volts, the advisability of purchasing a bank of small 6,600/110-volt transformers was at first considered. However, two 15-kva. 2,200/110-volt transformers were found available, and the following changes and connections successfully solved the difficulty.

Power is transmitted as generated, at 6,600 volts, from two hydro-electric plants to the mill and mine, where the transformer substations are. At the mill the bulk of the power is utilized at 2,200 volts, six 125-kva. transformers serving this load. Duplicate lines run from switch house No. 1, where the two plants are tied together, to the mill. These are for the purpose of insuring continuity of service to the mill in case of line trouble. One of these lines was used to carry the 2,200 volts back to switch house No. 1, and from this point the 2,200 volts was carried back on the 6,600-volt line to the point near power house No. 1 adjacent to the penstock.

As much of the mill and mine load as could be carried by power plant No. 2 was delivered over the line from the plant through switch house No. 1 to the mill and from there through switch house No. 2 to the mine. The disconnecting switches of the lines between power plant No. 1 and switch house No. 1 and between switch houses No. 1 and No. 2 were opened and jumpers connected across these lines at switch house No. 1. A temporary line to bring the 2,200 volts from the mill to these lines at switch house No. 2, a distance of about 1,000 ft., completed the necessary circuit and brought the 2,200 volts to a point near the penstock.

A temporary outdoor substation, as shown in the accompanying illustration, was then installed at the penstock and connection made to the nearest tower in the transmission line, the two 15-kva. transformers being operated in open delta.

FREDERICK KRUG,
Electrical Engineer.
New York & Honduras Rosario Mining Company,
San Juancito, Honduras, C. A.

Battery Wagon Saves One Man in Lamp Maintenance

A 750-LB. tower wagon equipped with forty-eight battery cells has proved to be an economical feature of the equipment of the Hartford (Conn.) Electric Light Company's distribution department. It is furnished with a rigid tower and platform for the use of the trimmer, the platform being about 11 ft. above the roadway, and is capable of making 12 miles per hour on the level. From 3.5 kw.-hr. to 4 kw.-hr. per day is consumed by this wagon, which ordinarily covers about

ONLY ONE MAN IS REQUIRED WITH THIS ELECTRIC MAINTENANCE TRUCK

11 miles each twenty-four hours. The outfit went into service in July, 1914, and this particular type was adopted to eliminate sending out two men to replace burned-out lamps, which would be necessary if the

ordinary type of business wagon were used in connection with a stepladder.

The ornamental lighting system at Hartford consists of 592 gas-filled incandescent lamps, of which 228 are single and 182 are double units. C. M. Yale, superintendent of distribution, states that the company considers the electric wagon for this type of work superior to the horse-drawn wagon or to a small gasoline runabout, owing to the ease with which it can be operated and to the frequent stops necessary. The cost of the equipment, which includes tool and supply boxes installed in the wagon body, was $1,030, and the total repair cost from 1914 to 1921 was $2,202, including extras not due to its service. It ran 22,918 miles and the actual maintenance cost was about $1,200.

W. M. THAYER,
Manager Vehicle Sales and Battery Department.
Hartford Electric Light Company,
Hartford, Conn.

Large Field Rheostat Rebuilt to Eliminate Troubles

CONSIDERABLE trouble was repeatedly occurring on three generator-field rheostats at the Holtwood station until recently, when the rheostats were remodeled by the station's maintenance organization. The original construction of the field rheostats proved to be faulty for the following reasons:

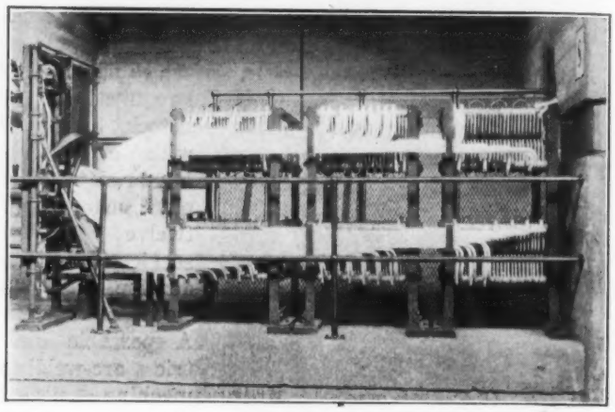
1. From one to four ⅛-in. copper washers were used between the contact surfaces of the grids with the idea of lowering the resistance at these points. The surface of many of these washers was not absolutely true and the copper oxidized when heated. This trouble was cumulative, the connections sometimes becoming red hot.

2. The cables comprising the connections between the grids and the dial were carried in a form in the center and over the top of the rheostat, thus being subjected to the heat from the grids, especially where the wires were threaded between the groups and over the top of the grids to the terminals. The cable originally used for the grid connections is that known as "underwriter's wire" with slow-burning insulation. The heat from the grids caused this insulation to deteriorate and break away from the cable, resulting in oxidation of the wire and short circuits.

3. The type of terminal used was that in which the cable is secured by setscrews. As these screws clamp but a limited number of the strands, a good connection is not possible. An effort was made to avoid this trouble by soldering the strands together, but the solder was melted out by the heat from the grids and a loose connection resulted. On several different occasions cables have burned off entirely at these terminals.

As it was impossible to keep the generators out of service while the rheostats were being rebuilt, it was necessary to make up some form of resistance which could be used during this period. This was successfully accomplished by the proper grouping of a number of standard resistance boxes, each having a capacity of 30 amp. to 40 amp. This rheostat was divided into six sections controlled by quick-break knife switches. As the current to be handled ranged from 250 amp. to 500 amp., this was a problem in itself.

The rebuilding was done as follows: (1) The twelve groups of grids comprising the rheostat were removed from the frame and each set of grids was taken apart. (2) The contact surfaces of each grid were cleaned and trued up by means of a counterbore and surfaces checked for parallelism with a micrometer. (3) The mica insulating sleeves on the clamping bolts were removed and replaced with new ones. (4) The grids were reassembled in their original order, but no metal spacing washers were used except to balance the terminals. These washers were turned in a lathe from cast-iron stock and extend ½ in. beyond the boss of the



LEADS ON THIS RHEOSTAT WERE REMOVED FROM TOP AND ARE NOW LOCATED AT SIDE, AS SHOWN, TO PREVENT OVERHEATING

grid to increase the radiating surface. (5) A clamp type of terminal was substituted for the setscrew type and no solder was used in the ends of the cable. (6) In mounting the groups in the framework they were turned 90 deg. from their original position, thus bringing one-half the total number of terminals to each side of the rheostat and permitting all wiring to be carried on the outside away from the heat as the illustration shows. (7) The cable used in rewiring these rheostats is No. 3/0 B. & S. gage, stranded, with asbestos-braid insulation. This cable had given excellent service in the rheostats for other generators in the plant.

The elimination of the troublesome copper washers decreased the spacing between the grids to a slight extent, and this probably accounts for the fact that the grid temperatures run somewhat higher in the rheostat as rebuilt in comparison with those obtained before the overhauling was done. The maximum grid temperature observed before rebuilding was 210 deg. C., while the maximum temperature noted since this work was completed was 270 deg. C. (current density 480 amp. per square inch). A considerable reduction in the temperature of the grid connections in favor of the new design was obtained, as the maximum temperature observed in the original construction was 144 deg. C. against 131 deg. C. in the new arrangement.

FRANK I. MORGAN.
Pennsylvania Water & Power Company,
Holtwood, Pa.

Maple Cleats Prove Useful in Heavy Construction

PORCELAIN cleats such as are ordinarily used for insulating and supporting low-voltage cables very often are broken, and for this reason it was decided to use hard wood to support the heavy cables installed in a substation recently built in San Francisco. A large amount of 2,000,000-circ.mil cable was used in this station in wiring up two 500-volt rotary converters. Strips

of treated maple were bored out to conform to the size of the cable so that when two of the strips were placed together they formed a series of connected cleats. These strips were sawed off to the length required and, according to J. E. Woodbridge, engineer of Ford, Bacon & Davis, a considerable saving was thereby effected in the cost of the construction.

FIELD EDITOR ELECTRICAL WORLD.

San Francisco, Cal.

Maintaining an Electric Hoist

A TRAVELING electric hoist in a foundry or erecting department is an effective time saver, but it must be kept in first-class order. In the first place, it should have no structural defects; for instance, one supporting I-beam must not be narrower than another, as this might cause the motor and cable drum suddenly to lurch to one side every few minutes—that is, where the beam is single. No bolts connecting rail ends or holding cross-bars supporting the conductor insulators should be so long as to strike the machine every time it passes. Bolts actually holding the insulators ought to have double nuts as they get enough jar and vibration to loosen single nuts, which may cause the insulator to sag out of place.

Where the feed wires connect to the conductor rails they should be bolted through copper lugs absolutely tight and held so with lock washers. If the machine carries broad shoes making contact against flat iron conductor rails, their springs are liable to weaken or be gummed with grease after a while, and perhaps only two out of three shoes then carry current, a condition which will not permit a three-phase motor to operate. Then, again, if the live rails are cut out of level in places, the shoes may fail to make contact just there, and perhaps the machine may be stopped at such a place and refuse to start again. In one foundry the trouble with the shoes not making a good positive contact at all times was overcome by riveting to the surface of each shoe a flat strip of copper $\frac{1}{8}$ in. thick, 2 in. wide and 5 in. long. This not only increased the tension but had a slight coppering effect on the iron rails.

Sometimes, when everything seems in good order and yet the crane will not move, trouble may be found in the rheostat, owing to one or two of the copper fingers not touching the segments. If the motors are direct-current or slip-ring, any short brushes or weak springs should be renewed. The motor bearings should be oiled each week regularly, and the dust and dirt should be blown out every few weeks. Coating the winding with an insulating varnish once in a while will tend to keep out the moisture to which a motor is subject in a foundry or when running out of doors. The main switch and fuses must be close by, so that if anything goes wrong with the crane no time will be lost cutting off the current. It is well to have one or two ruby lamps connected across the switch in plain view at all times to show that the current is on, especially on 440 volts.

If the crane refuses to move after a seemingly careful search reveals no defect, start at the top of the fuse block and test the line with a suitable lamp. If current is found here, then test through the fuses, then through the main switch, especially at the binding posts, and then up at the live rails where the line connects. By this time a dead line may be found, showing that there is a disconnection somewhere. If the line is complete up to the rails, then go along the rails and use the test lamp freely, especially at each end. If no break can be found, the trouble may be in the rheostat, which should be opened and the lamp applied. The open circuit may be found in a broken armature lead or a brush which does not touch the commutator, although it may seem to. The brush may need cleaning or replacement.

When repairing a crane, if there is any occasion to remove any leads, be careful not to reverse them, as the machine may operate backward without any warning. When making repairs it is well to place a card on the switch even though the fuses are removed, for some one could easily replace them, not knowing why they were taken out. If, for any reason, the limit switch does not stop the motor when the tackle block goes too high, the contacts should be looked after, as the undue strain may either break the lifting cable or blow out the fuses. If the crane is operated from the floor by a long rod, this rod should be well insulated either by placing a rubber hose over it or by covering it with insulating tape and varnishing it.

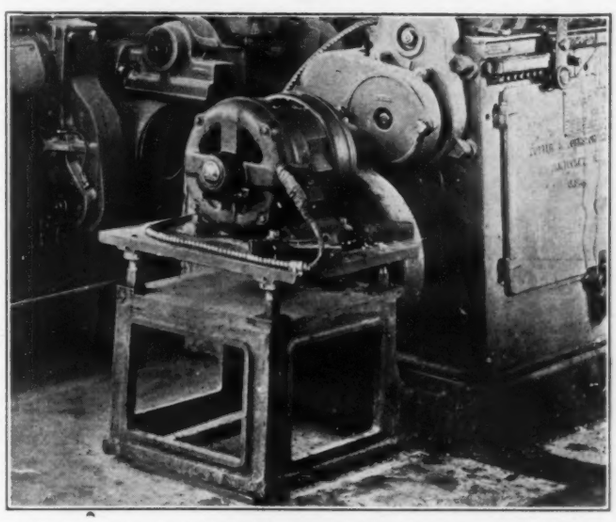
H. S. RICH.

East Berlin, Conn.

Adjustable Motor Mounting Permits Accurate Line-Up of Gears

IN ORDER to obtain a precise line-up of gears an adjustable motor mounting is applied at the East Springfield (Mass.) factory of the Westinghouse Electric & Manufacturing Company. In the application of these motors a $\frac{7}{8}$-in. x $16\frac{1}{2}$-in. x $20\frac{1}{2}$-in. metal platform is provided, as shown in the accompanying illustration. The motor platform rests upon four flat heads, each carried at the top of a screw and movable up or down by the simple expedient of inserting a metal rod or key in a hole in the head of the spindle. The spindles rest upon a hollow base as shown.

This mounting is on a group of Potter & Johnson 5-A



MOTOR HEIGHT MAY BE ADJUSTED ACCURATELY BY MEANS OF FLAT-HEAD SCREWS UNDER PLATFORM

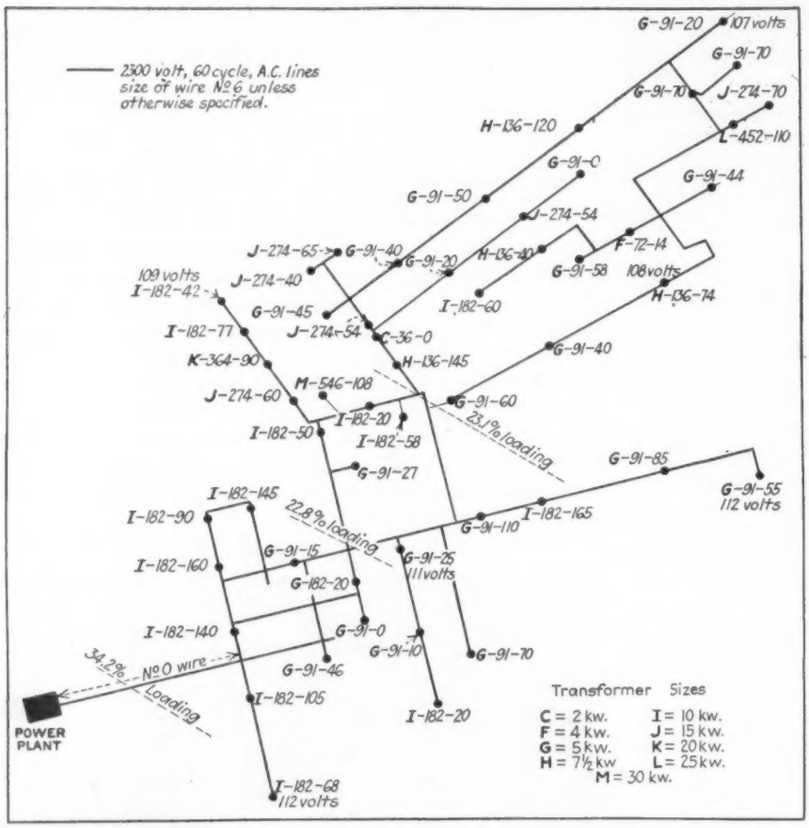
automatic machines of the turret lathe type, each individually driven by a 3-hp., 440-volt, three-phase motor running at 1,160 revolutions per minute. These machines are placed back to back to save space and are symmetrically fed by electric service leads carried in rigid conduit branching from overhead runs.

Westinghouse Electric & Mfg. Co. R. P. KING,
East Springfield, Mass. Works Engineer.

Analyzing Distribution System to Prepare for Expansion

DISTRIBUTION circuits should not be laid out solely for present conditions but should be planned with the future in mind. To do this it is necessary to study the density of population in the various parts of a city to ascertain whether future expansion will be in the same direction as that of the past. Such a study has been found particularly beneficial at El Paso, Tex., where it has been necessary to make many short line extensions, oftentimes without the opportunity for careful study with future requirements in view. For that reason it was decided to make a thorough analysis of the distribution problem.

The distribution system consists of overhead and underground wiring conveying single-phase and two-phase, 2,300-volt energy to almost every point in El Paso and across the Rio Grande in Juarez, Mexico. The population served in the city of El Paso alone is in the neighborhood of 100,000 and the territory covered within the city limits is 11¼ square miles. The density of population therefore is not so great as in the majority of cities of this size. The steam generating plant is situated in the southwest corner of the city, although one of the largest consumers is established in the northeast corner of the city. Other consumers of large blocks of power are situated at considerable distance from one another. These conditions have naturally required the use of a three-phase, 13,000-volt transmission system.



LINE DIAGRAM FOUND USEFUL IN STUDYING A DISTRIBUTION SYSTEM

The population therefore is not so great as in the majority of cities of this size. The steam generating plant is situated in the southwest corner of the city, although one of the largest consumers is established in the northeast corner of the city. Other consumers of large blocks of power are situated at considerable distance from one another. These conditions have naturally required the use of a three-phase, 13,000-volt transmission system.

Each lighting circuit is studied separately by means of a skeleton one-line diagram with correct copper and transformer sizes inserted, but without uniform scale. During the winter months peak loads on all transformers are obtained by the use of instantaneous ammeter readings at peak hours. The voltage conditions are also ascertained similarly by instantaneous readings. The accompanying diagram gives a typical layout showing transformers with rating in kva. and amperes, sizes of wire, the accumulative loads on each wire at junction points and, where the sizes of wire change, voltage for sections and actual loading of transformers in amperes. Unbalancing of transformers has been made the subject of special study. With this information it has been possible to determine the most strategic section for wire reinforcement, and in some cases to determine where exchanges in different sizes of wire were advantageous. It is the intention to keep about twenty maximum-demand meters in constant operation throughout the system, placing one meter on the supply side of each transformer for three or four nights and then changing it to another location. If it is possible to cut in such a meter on the line feeding a number of transformers at the same time the individual transformer demands are taken, the diversity of each part of the system can readily be obtained. By this method it will be possible to get a constant check on peak-load conditions. By checking the sum of the loads on a circuit with the power-plant readings it has been found that in lighting circuits it is reasonable to believe that the maximum demand of practically all transformers occur at the same time.

The line losses were determined rather closely after obtaining the loading and voltage conditions, and from such determination it was possible to decide whether a circuit should be fed from the main steam generating plant or from a substation fed from the 13,200-volt transmission line. Out of the study which has been made it has developed that the present railway and lighting substation, situated approximately 6 miles (9.6 km.) from the power plant, is the center of distribution for a large portion of the residential section of the city. In addition, it was found advisable to locate two more lighting circuits and two or three street lighting transformers at this substation.

In obtaining the data upon lighting lines it was possible to pick out many transformers which could be replaced by either larger or smaller ones according to the existing conditions. This tended to improve service or to reduce the transformer investment per kilowatt connected load. The study also brought out the fact that occasionally in a bank of four transformers one would not be working at all. For some reason the fuses would blow and the investment of this apparatus would be hanging on the lines idle with the remaining transformers overtaxed. On the face of it this condition might seem absurd, but even on a carefully maintained system such things will happen. The subject of proper transformer banking is receiving special consideration.

Line maintenance correctly scheduled is the only way

properly to insure a system against poor service. Excessive investment conditions such as have been outlined will come to the surface through a carefully prepared line maintenance schedule without unnecessary loss of time, and in addition the property will be maintained in better condition than with a system of "hit-and-miss" maintenance.

In addition to obtaining data on voltage conditions, maximum transformer capacity, installed capacity, size of wire, etc., a curve showing the monthly maximum-demand recorded on power-station meters is of utmost importance. At a glance it is possible to note any sudden increase or decrease in the load which is put upon each circuit, and any such changes can be made a subject of immediate study in case a condition arises that calls for an increase in capacity to benefit service or a decrease of capacity to benefit the investment. As the line study progressed other things were constantly brought to attention.

Two-phase, 2,300-volt power circuits are to be approached in a slightly different manner inasmuch as maximum transformer loadings do not occur at the same time throughout the city. The loads on these transformers should be taken by graphic meters and the instantaneous voltage taken at the time of maximum loading of each transformer. In the case of power circuits it will probably be true that owing to diversity in the motor loads the sum of the transformer maximum demands will not govern the size of the wire in the branches.

From results which have already been obtained in this direction, it is manifest that the two-phase, 2,300-volt power lines extend such a distance from the generating plant that a substation a few miles from the generating plant and supplied with our 13,200-volt transmission service would save a considerable amount annually by the reduction of line losses.

It is generally true in companies of this size and smaller that the strict electrical engineering of distribution is made a minor part of the work. In fact, nobody is detailed primarily for the purpose of saving money in distribution. Usually the expense of obtaining business and establishing service is considerable, and the line study described has indicated that the net revenue would be increased in a great many cases if some of the money allocated to solicitation were spent on increasing the distribution efficiency.

El Paso Electric Railway, P. M. HATCH,
El Paso, Tex. General Supt. of Light and Power.

Fiber Rollers on Armature-Winding Stand Do Not Cut Motor Shafts

FIBER rollers have been found very satisfactory for an armature-winding stand of the separate-support type used in a Pennsylvania shop. Originally the stand was equipped with cold-rolled steel rollers 1 in. thick by 2½ in. in diameter, upon which the armature rested. These worked satisfactorily on lighter armatures, but when use was made of the stand to support an armature weighing 600 lb. the rollers scored the shaft quite badly. This occurred despite the fact that the shaft was 0.40 per cent carbon steel.

The steel rollers were replaced with rollers made of black fiber, ⅛ in. thick, sheet stock being used for the purpose. Some doubts were entertained at first as to how the fiber would stand up in service, but the results obtained are all that could be desired. There is, of course, no possibility of scoring the shaft and the fiber shows no tendency to mushroom or crack, even under the heavy armatures mentioned. J. M. WALSH.

Honesdale, Pa.

Blowing Post Holes with Dynamite Saves Expense

THE use of dynamite in digging post holes has proved economical and satisfactory according to the experience of the Canton (Ill.) Gas & Electric Company. The principal saving accomplished by the method resulted from the fact that line crews placing poles could be considerably smaller. Depending upon whether the digging was in soft soil or was very difficult, it took from five to ten men to dig as many holes by hand as were dug by two men using dynamite.

It was found on starting the use of this method that two men only were needed to dig the holes, that number being able to keep ahead of the pole-setting crew without much trouble. One man dug the first spading while the other drilled a 2-in. hole 4½ ft. deep. The post holes were to be 5 ft. deep, and the drill holes were stopped 6 in. from this desired depth because the explosion had sufficient downward force to depress the earth approximately 6 in. Under average digging conditions it was found that two men could blast and clean out about twenty-five holes per day, while it required at least five men to finish that many per day by hand.

Prices of both labor and material have changed since this method was used by the Canton Gas & Electric Company, but its experience shows that a saving of about 45 per cent can be accomplished. A 1-lb. stick of dynamite is used for each hole. When the foregoing comparison was made (June, 1921) the quotation on dynamite was about 26¾ cents per pound. Twenty-five sticks a day on an average will be used, the total cost of material being $6.70. With men kept on the job, as is necessary in building a transmission line of any length, board and lodging averaged $2.50 per day per man. Linemen's pay in most parts of the country was about 85 cents per hour, on the basis of an eight-hour day. Thus the total cost per day per twenty-five holes blasted with dynamite ran slightly over $25. This amounts to approximately $1 a hole. According to the figures supplied by the Canton company, five men would be required to do the same work by hand, making the same number of holes cost $46.50, or $1.85 per hole. These figures are necessarily approximate and would vary in other sections of the country, but they show that a saving may be accomplished by the use of dynamite.

The main difficulty with this practice is the lack of earth from the hole for use in tamping in the pole, as the charge blows a clean hole and compresses the earth, it being necessary only to clean out the neck of the hole, using post-hole digger or spade. In rural sections the necessary earth is easily obtainable, but in city work the difficulty is not so easily overcome. Another drawback to the use of dynamite in cities is the restriction laid upon the use of any explosive, and although ordinances vary in different cities, the cost of license and the care necessary for using dynamite often increase the cost per hole above that of the hand method.

This information was secured from E. H. Negley, secretary-manager Canton Gas & Electric Company.

Chicago, Ill. FIELD EDITOR ELECTRICAL WORLD.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

Let Us Make It Easier for Employees to Use Electrical Appliances

A Practical Solution Offered by George W. Hurn, Manager Haverhill Electric Company, Haverhill, Mass.

AS A CENTRAL-STATION policy, the use of electrical appliances by officers and employees of lesser rank should be encouraged by practical arrangements for putting such equipment into their hands. If the men who are selling these different appliances do not know from actual experience what the devices can do and what the cost of operating them is, how can we expect to convince our customers? An interesting investigation was made recently by the merchandising division of the Commercial Section, New England Division, N. E. L. A., as to the extent to which employees and officials of central-station companies are using appliances. Forty-five companies submitted data, and these embraced 218 officials and 6,492 other employees, or a total of 6,710. Seventeen well-tried appliances were listed. From a study of these data it appears that more than half of these utility people, or 3,769, still do not use electric flatirons, 5,049 do not use toasters, 6,058 have no electric percolator, 5,593 have no electric fan, 5,934 use no electric washer, 5,055 have no vacuum cleaner, 6,461 do not use the electric range, and so on. In other words, only about 20 per cent used any of these seventeen appliances except the flatiron.

G. W. HURN

We are very much undersold within the industry. Interest in ourselves as "prospects" is developing, and throughout the companies affiliated with Charles H. Tenney & Company there is coming about a healthy rivalry to increase the use of electrical conveniences in the homes of officers and employees alike. We do not want percentages like those brought out in the New England Division, N. E. L. A., at the recent New London convention to be repeated another year in this part of the country.

If the utility manager is a good user of electric appliances, much is gained in carrying the work forward. In response to a recent inquiry by the ELECTRICAL WORLD, I may say that in my own home I have in use at present an electric range, a vacuum cleaner, a washing machine, a flatiron, a toaster and a coffee percolator. I am also testing out a refrigerating outfit which is proving very satisfactory, and the figures obtained from tests of devices through separate meters in the home of a utility manager are very helpful and convincing. Personal experience, backed by figures from one's own installation, carries weight in local sales work. I do not mean to imply that I have all the appliances that I would like or should utilize, but as an illustration I think I have more in use than many other men in this line of business.

Instances are not rare where a sale can be made by referring the "prospect" to the manager's or other employee's own household for unbiased testimony on the value of this or that equipment.

Our company at Haverhill sells appliances to employees at cost, and they are allowed to pay for them in weekly installments. The period covered may be a year, or in some cases even two years, depending on the device purchased. The sale is made on the understanding that the device is for the employee's own use. In this way we are making a more vigorous effort to increase the use of appliances within the central-station family, and I believe that lasting good to the industry will follow the adoption and maintenance of liberal and progressive policies along this line.

Newspaper Tells of Utility's Importance to City's Affairs

EVIDENCE of public appreciation of the importance of a utility's service to a community is shown in the accompanying reproduction from the Drumright *Evening Derrick* of a half-page story about the Oklahoma Gas & Electric Company. The local newspaper has told here in an interesting manner the scope of the company's service and how it plays a leading part in the life and development of the city. The company's policies with regard to service and its customer and employee ownership plans are outlined, and an intimate personal touch is given in a brief account of Manager Walter B. Miser's experience in the public utility field.

A BIG FACTOR IN DRUMRIGHT'S LIFE AND DEVELOPMENT

Oklahoma Gas and Electric Company Serves 18 Communities With Gas and Electricity —Drumright Plant One of the Finest in the State

LOCAL MANAGER OF OKLAHOMA GAS AND ELECTRIC CO. PLAYS ACTIVE PART IN DRUMRIGHT'S COMMUNITY AFFAIRS

"To Properly Serve Its Customers" is Policy of Company Which Has Helped to Build Drumright—Citizens and Employees Stockholders

A STORY OF A UTILITY'S PART IN COMMUNITY DEVELOPMENT

Other central-station companies have found that similar articles published in the local daily papers have gone a long way in giving the public a clearer understanding of utility aims and problems.

A Call-Back Card Used by the Troubleman

BY USING the card shown here the Chattanooga (Tenn.) Railway & Light Company has injected a new touch of thoughtfulness into its repair service. When a repairman calls at a customer's house to take care of a trouble order or to make repairs and finds no one at home he fills out the reverse side of the card, indicating when he will return, and leaves it in the door. The customer therefore not only knows that he has called but when to expect his return without having to telephone the company's office, and it is seldom that the repairman does not find some one in when he calls back.

"This card, in addition to facilitating the work of the

DATE Nov. 9 1921

WE CALLED TODAY TO REPAIR YOUR

Vacuum Cleaner

BUT FOUND NO ONE AT HOME. UNLESS YOU NOTIFY US WE WILL CALL AGAIN.

DATE Nov. 11 ABOUT 11 A. M. ____ P. M.

JOHN D. DEITZ
SERVICE MANAGER

SALES DEPARTMENT
CHATTANOOGA RAILWAY & LIGHT CO.
620 MARKET STREET

Over

CARD USED BY COMPANY'S REPAIRMAN

repair department, is greatly appreciated by the company's customers," says L. J. Wilhoite, lighting sales manager of the company. "It makes them realize that we are on the job regardless of whether or not they stay at home."

Pioneering of Electrical Appliances a Divided Responsibility

BY LEWIS A. LEWIS
Sales Manager Washington Water Power Company, Spokane, Wash.

UP TO this time the central-station companies of the country have been the pioneers of practically every electrical device that is on the market and have paid the price of such development. It is a question whether the utilities, rigidly regulated as they are, can afford to spend the money that they have spent in the past for the pioneering of the future. I do believe, however, that such appliances as refrigerating machines and electric ranges and water heaters must be exploited by the central-station company, and they will in time with the co-operation of the manufacturer be remunerative. The companies should be relieved of this expense in connection with such appliances as dishwashers and ironing machines, whose gross revenue is of little consequence and does little more than to popularize electricity.

The Washington Water Power Company has done as much as any central-station company in the United States in the development of the electric range and water heater. We do not regret it as we are now beginning to receive earnings from this type of load. I believe we were the first company to give an order for a carload of electric irons, and we spent a great deal of money in publicity, popularizing this device, and there is no question that we have been benefited by this action. The same has been true of the vacuum cleaner and washing machine, but in the case of these appliances we have had in mind the merchandise profit, and our expenditure for development was only in proportion to good merchandising practice.

As soon as a household refrigerating plant is perfected and can be sold at a popular price I think it would be the policy of most progressive central-station companies to get behind a campaign to popularize that machine. It will be a real revenue producer, while, on the other hand, the development of the dishwasher is of minor importance to the average company. For my part, I think that the development of the dishwasher must be put strictly up to the manufacturer, or it must be sold to the dealer at such a price that he can profit by its exploitation. The ironing machine is in somewhat the same class—electrically heated the maximum demand causes a customer expense which is not justified by the revenue, and when gas-heated the revenue is less than that now received from the ordinary hand iron. We have sold many electrically heated ironing machines, but, as with the vacuum cleaner and washing machine, sales have been on a strict merchandising margin.

What Other Companies Are Doing

Minnesota.—During October the securities department of the Southwestern division of the Northern States Power Company sold 362 shares of the company's preferred stock to 104 shareholders. Thirty-two sales were made to employees of the division during the month, which with the present stockholders gives this division a 100 per cent list of employee-shareholders.

Easton, Pa.—A successful electrical show was conducted recently under the auspices of the Easton Electrical Education Association, whose members are made up of the employees of the Pennsylvania Edison Company, electrical contractors, dealers and electrical men employed in the various manufacturing concerns in and about Easton. The show had the thorough support of the newspapers, merchants, school board and colleges in Easton and Bethlehem. Eight thousand people attended the show during the three evenings and one afternoon that it was open.

Cleveland, Ohio.—The third "home electric" of the Cleveland Electrical League was recently opened for four weeks in East Cleveland. Thousands of girls attending domestic science classes, members of women's clubs and teachers in the schools and colleges were especially invited to inspect the house. As the first and second homes drew visitors principally from Cleveland Heights, Lakewood and the west side of the city, the third home electric gave many people their first opportunity to see an electrically modern dwelling.

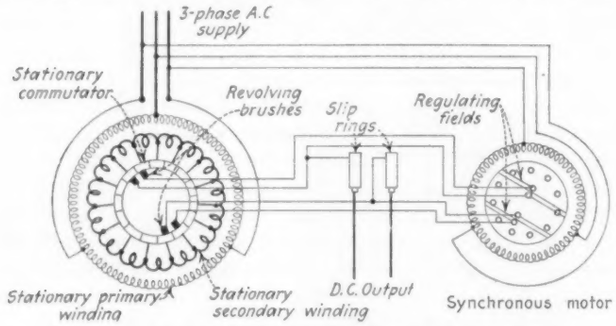
Boston, Mass.—The employees' loyalty committee of the Edison Electric Illuminating Company has issued an attractive booklet for popular distribution. It explains the "how" and "where" of electrical generation and distribution on the company's system and gives the non-technical reader an interesting illustrated account of the company's latest developments and facilities.

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Motors, Generators and Transformers

Converter with Stationary Windings and Core.—S. SHIIO.—An alternating-current-direct-current converter using the principle of a polyphase induction motor with its revolving field is described in this paper. To obtain direct current, alternating current is applied to the stationary stator and the brush gear is rotated at synchronism about the commutator attached to what would be the rotor, which in this case is also stationary. The position of the brushes is automatically adjusted



MAIN WINDINGS OF THIS CONVERTER ARE STATIONARY WHILE BRUSHES REVOLVE

in such a way as to give maximum potential difference between the positive and negative brushes. The only revolving parts of the machine are the direct-current brushes, the two direct-current slip rings and the synchronous motor which drives them and which is small compared with the main windings and core of the machine. The windings which carry the main current are stationary.—*Journal of the Institute of Electrical Engineers of Japan*, No. 395.

Laminated and Transposed Conductors for Large Generators.—F. PUNGA and H. ROSA.—Many methods of transposing the component wires in built-up conductors of large turbo-generators which have been patented in recent years are described in this article. They are all combinations of single and multiple flatwise and edgewise bending and offsetting of copper strips. The fact that very high additional losses occur in large solid copper rods in deep slots, owing to uneven flux distribution within the slot, has made it necessary to adopt some subdivided conductor the individual strands of which are insulated from each other and so twisted or transposed that each of them takes up consecutively several different positions within the slot. To insure the least loss the individual strands must be twisted fully 360 deg. within each slot. The insulation of the strands has to be perfect both electrically and mechanically, because the rods are pressed into the slots with considerable force. No dependable results can be achieved with round wires. Not only is their insulation difficult and unreliable, but the finished rods lack stiffness. Very good results were obtained by subdividing the total required copper cross-section into a relatively small number of rectangular strips insulated from each other by mica foil and subsequently pressed and baked to the desired shape. This gives a finished rod, virtually as solid as a one-piece conductor.—*Elektrotechnik und Maschinenbau*, Oct. 2 and 9, 1921.

Recent Water-Turbine Developments.—W. H. WHITE.—Machines and settings are, this paper asserts, now sufficiently perfected to handle any conditions imposed by superpower schemes. The value of low velocity in spiral casings of draft tubes, siphon settings, fall increasers, etc., is discussed.—*Canadian Engineer*, Oct. 13, 1921.

Traction

Report of Committee on Electrolysis.—The 1921 report of the American Committee on Electrolysis is a collection of the known facts on electrolysis and its mitigation. Design, construction and operation of railways and underground structures, electrolysis surveys, European practices and research are all covered. In a 204-page discussion the committee makes this recommendation: "Prior to the consideration of measures of electrolysis mitigation, the following features should be given due attention: (1) Measures tending both to railway economy and the reduction of stray current: (a) The return system, including track bonding, should be put in proper condition; (b) the number of substations should be made a maximum consistent with railway economy. (2) Measures employed solely for electrolysis prevention. Where necessary to effect a still further reduction in electrolysis below that provided by the most economic railway system, one or more of the following measures should be taken: (a) Applicable to railways—additional substations, insulated feeders, a modified system of power distribution, such as a three-wire system; (b) applicable to affected structures—insulating joints in pipes and cables, insulated coverings for pipes; (c) interconnection of affected structures and railway return circuits—electrical drainage of cable sheaths, electrical drainage of pipes." In the summary of good practice some comment favorable or unfavorable is based upon most of the methods of electrolysis mitigation which have been attempted. It is interesting to remember that this report is a unanimous one. Other chapters in the book treat "Electrolysis Surveys," "European Practice" and "Electrolysis Research." Under the first of these headings there is an excellent portrayal of the whole question of electrolysis surveys, their purpose, scope, possibilities and interpretation, as well as the instruments available for making them.—(Report is obtainable from the American Institute of Electrical Engineers.)

Railway Situation in Berlin.—Large reductions in operating expense made necessary by the present conditions have been effected by the consolidation of various street and suburban lines in Greater Berlin and by improving traffic conditions. — *Electric Railway Journal*, Nov. 5, 1921.

Applications of Electric Arc Welding.—According to this rather complete paper, successful welding calls for three prime requisites, proper equipment, proper materials and a certain inborn skill. A list is given showing a very large number of applications of electric welding in railroad work.—*Railway Electrical Engineer,* October, 1921.

Arc-Welded Rail Joints.—Experiences in the city of Detroit with the electrical welding of rail joints. Tests were made showing temperature rises on rails welded in several manners.—*Welding Engineer,* October, 1921.

Choice of Locomotives for Mine Service.—H. H. JOHNSTON.—This paper asserts that locomotives with dynamic-braking controllers deliver current on descending grades and must have additional motor capacity. The effect of low-voltage and series-and-parallel control versus series-parallel control is discussed. Solid side frames, it is stated, increase motor temperature.—*Coal Age,* Nov. 13, 1921.

Generation, Transmission and Distribution

Burning Powdered Coal and Blast-Furnace Gas at River Rouge—THOMAS WILSON—This article gives details of the arrangement and construction of the boilers and their control, the pulverized-coal equipment and the layout of the gas piping and burners, performance guarantees and the operating force required.—*Power,* Nov. 1, 1921.

Photographic Representation of the Electric Field.—B. ELL.—The photographs accompanying this article will catch the eye of every reader, but, unfortunately, the author does not explain sufficiently how the results were obtained. Using a static machine, distinctly different pictures are obtained with a positive and with a negative charge. It is possible that what the author calls the electric field is merely the corona distribution around and near the conductors.—*Elektrotechnische Zeitschrift,* Oct. 20, 1921.

Relation of Run-Off to Rainfall.—An attempt to formulate with some reasonable certainty a comparison between the amount of rainfall and the run-off in different kinds of soil and other conditions.—London *Engineering,* Oct. 7, 1921.

Developments in Power-Station Design.—A study of generation of electricity by waste from blast furnaces, coke ovens, etc. The plants described supply local generating systems with the maximum amount of energy possible with the waste heat available. All regulation is done at the main power stations of the system.—London *Engineer,* Oct. 7, 14 and 21, 1921.

English Generating Station at Blackburn.—A description of a station containing two 6,600-volt turbo-alternators of 10,000 kw. rating each which has been erected at a cost of £850,000. The coal and ash-handling plants, boilers, turbo-alternators, cooling towers, switchgear, transformers, etc., are covered.—London *Engineer,* Oct. 21, 1921.

Study of Chain-Type Insulators for Highest Voltages.—A. FONTVILLE.—It is at present still very doubtful with what safety factor a chain of disk type insulators really operates. In spite of the fact that there are today a number of transmission lines operating at more than 100,000 volts, there is insufficient information about the most favorable construction and the best dimensions of the insulator chains for these extreme tensions. One of the most puzzling problems has been to measure accurately the voltage distribution along the different units of such chains. That this distribution is by no means uniform was soon recognized, and several methods were devised to measure the voltage drop along the disks. The author describes in this paper four different measuring methods and shows that the results obtained by these entirely different methods are sufficiently similar to permit of a good check and a fair average value. The paper deals first with methods to measure the small capacity of the disk. For this the use either of a ballistic galvanometer with a standard condenser or of an electrometer is suggested. The bridge method of Gott is less suitable. It is emphasized that the dielectric losses of these chain insulators increase rapidly with increasing frequency, to which fact is due the overheating during high-frequency overvoltage surges on the line. The four methods to determine the voltage distribution along the insulator chain are: (1) Use of a 100,000-volt Kelwin electrometer, either direct or by the compensating method, the latter being preferable. (2) Use of a small testing spark gap of sewing-needle points. (3) Use of a potentiometer according to Peek or De la Gorce. The uniform distribution of the voltage along a zigzag bent tube filled with water and equipped with equidistant voltage taps, as used by Peek, is doubted by the author on account of the not negligible capacity of self-induction of such a tube. The author uses a vertically stretched-out string wetted from above with water from a funnel. The voltage distribution along this wet string is almost proportional. (4) Use of an auxiliary transformer to produce a certain phase displacement, permitting the graphical determination of the voltage distribution. Comparing the results obtained from these four methods, a variation of only about 1 per cent is found. As has been proved by Thomas, Imslay and Peek, the insulators do not stand up well against overvoltages and sudden surges. The author claims, however, that it is wrong to attribute a breakdown of a chain to the aging of porcelain. Such chains are used only for about four or five years, and it would be safe to assume that if aging of the porcelain has any influence upon the dielectric strength, it certainly would have manifested itself on other porcelains used on voltages of more than 50,000 for periods exceeding in duration fifteen years.—*Revue Générale de l'Electricité,* Oct. 29, 1921.

Miscellaneous

Nationalization of Electrical Power Plants in Japan.—S. TADA.—The problem of nationalization is treated not from the popular viewpoints of economy and industry but from the standpoint of social policy. It is the author's conviction that society should control the power plants for the benefit of its members. He advocates that the generated power be distributed to the people on a profit-sharing basis at a reasonable rate, and that the management be in the hands of a special committee invested with absolute power. The author believes that the present tendency toward amalgamation of power companies will give new power to capitalism and is a hindrance to nationalization.—*Journal of Institute of Electrical Engineers of Japan,* September, 1921.

Monelmetal Welding — MICHAEL DZAMBA.—General principles that must be observed in the welding of this difficult metal and special instructions for rods and sheets.—*Welding Engineer,* October, 1921.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

To Ask Regulation of Radio Interference

IN ALL probability the Department of Commerce will request a strengthening of the law governing the control of radio operation. The need for an addition to the existing law became apparent when the Supreme Court of the District of Columbia authorized a writ of mandamus requiring the Secretary of Commerce to issue a license to the Intercity Radio Company of New York.

It was stated at the Department of Commerce that the Intercity company, which operates its plant almost continuously, is interfering in a very material way with the operation of other radio systems. Just what legal steps will be taken by the department will not be determined, it was said, until the return to Washington of its solicitor.

Thirty-Million New York Edison 6½ per Cent Issue Oversold at Premium

A THIRTY-MILLION-DOLLAR issue of series A, 6½ per cent, twenty-year first-lien and refunding mortgage bonds of the New York Edison Company was placed on the market Monday and was greatly oversubscribed in just a few minutes at a 4½ point premium. So far as is known, this is the largest single issue of electric light and power company bonds ever offered at one time. The yield at the subscription price was 6.10 per cent.

In connection with this financing the company acquires all of the bonds and more than 99 per cent of the capital stock of the United Electric Light & Power Company, formerly owned by the Consolidated Gas Company of New York. For many years the two companies have operated virtually as a unit, and this action makes possible the creation of a single first and refunding mortgage.

Since 1903 the New York Edison Company has issued no bonds. During the past fifteen years the two companies have spent more than $85,000,000 for permanent extensions and additions, largely financed by the issue of stock and temporary obligations. The proceeds from the present issue will reimburse the companies in part for these expenditures. The New York Edison Company has $86,741,300 of stock outstanding, all owned by the Consolidated Gas Company, and, including the present issue, $68,071,000 of bonds. The properties of the two companies represent an investment of more than $220,000,000.

The gross earnings of the two companies for the twelve months ended Sept. 30 amounted to $50,694,825.71; operating expenses, maintenance and replacements, taxes, etc., to $36,052,095.68, leaving net earnings of $14,642,730.03.

The combined properties have a total rating of 820,000 hp., including the 200,000 hp. in the new Hell Gate station of the United company just coming into operation.

Question of Public or Private Development Involved

THE Federal Power Commission probably will consider at its next meeting the "high dam" project between St. Paul and Minneapolis. It is very apparent that the Northern States Power Company could utilize power thus derived to greatest advantage, but the matter is complicated by a very determined protest from Senator Nelson of Minnesota, who wants to see this development handled by a municipal corporation formed ten years ago under a special act of the Minnesota Legislature. This corporation is composed of the city of St. Paul, the city of Minneapolis and the University of Minnesota. In addition, the city of St. Paul is endeavoring to secure sole control of the water power.

Senator Nelson's main objection seems to be based on the allegation that the Northern States Power Company is a monopoly and that to give it jurisdiction over this additional power would add to the monopoly. The Federal Power Commission, however, is charged with the duty of considering the efficient utilization of the power. There will be considerable secondary power developed at the high dam, and there seems to be little question that the public utility company is the only applicant in a position to insure maximum utilization of the power available.

The municipal corporation has been in existence since 1911 and has done nothing toward developing the project. Some regard the application of the city of St. Paul as in fact an application of Henry Ford, because it is understood that he is to have first call on the power if the city of St. Paul be given the necessary permission to develop the project.

Inductive Interference Discussed by Independent Telephone Men

INDUCTIVE interference was discussed before the recent convention of the United States Independent Telephone Association at Chicago. S. P. Grace of the American Telephone & Telegraph Company discussed the subject from the standpoint of the telephone companies, telling of the difficulties with which the telephone engineers have struggled in the effort to develop methods of preventing interference with their service from inductive influences from many sources, including power circuits. Asserting that under the conditions of high voltage, close proximity of power lines to telephone lines and the long parallels that have grown so rapidly in the past few years it is difficult to reach a solution of the inductive-interference problem within the telephone system itself, Mr. Grace explained that the telephone interests were pushing the question with the

power interests because they had reached the point where to solve the problem they must have the help and co-operation of the latter.

Mr. Grace indicated in his discussion that there are some causes of trouble that will probably be counteracted only by adequate separation of the power and telephone lines, if substantial impairment of the telephone service is to be avoided. He made a plea for the utmost efforts at settlement of the issues on a co-operative basis, legal means to be only the last resort. He also asked the telephone companies to try to establish the most cordial relations with neighboring power companies and to study the problems of these companies.

W. J. Canada, for the National Electric Light Association, pointed out the necessity of developing means by which the service of both utilities can be given to the public by the use of the same highways, since separation in many instances is impossible unless the public along the highway in question forgoes one service or the other. The efforts being made by the N. E. L. A. to form state committees to forward the co-operative work between the American Telephone & Telegraph Company and its subsidiary companies and the various power interests were brought to the attention of the convention by Mr. Canada, and both he and Mr. Grace emphasized the work of the joint committee of the telephone and power interests that is endeavoring to work out a solution of the problem in such a way that future controversy will be avoided.

Planning to Rebuild Tallassee Dam that Went Out in 1919

TENTATIVE plans for rebuilding the Tallassee dam of the Montgomery Light & Water Power Company, which went down in 1919 during the heavy rains, are being considered. These plans call for a 20,000-hp. project, which is more than three times the capacity of the original plant. The high prices in the past, as well as the condition of the market for money, have made it impossible to go ahead up to date. The property, which is now in the hands of a receiver, is one of the Cities Service Company's subsidiaries.

Kentucky Operator Sees Increasing Public Confidence in Private Operation

CHARACTERIZING the situation as "clearing and not quite so warm," Donald McDonald, before the meeting of the Kentucky Association of Public Utilities on Nov. 22 at Louisville, said that the confidence of the people in the private operation of utilities is increasing. He sees a widespread disposition to give public utilities fair play.

In summing up Mr. McDonald gave this advice to the utility men: "Maintain your service, treat your customers respectfully, relax your rules if it is necessary in order to meet special cases, and raise your capital, as far as possible, among the people you serve."

Martin J. Insull urged the public utility men to take advantage of every opportunity to place the facts regarding their business before the public. The part the public utilities are playing in the "back to the farm" movement by furnishing electric, telephone and railway service to improve living conditions on the farms was brought out in his address. Good service was emphasized as the basis of good public relation.

M. H. Aylesworth, executive manager of the N. E. L. A., urged the utility men to have faith in their own business and to get out and tell their story to the public and cease complaining. While he admitted the value of holding-company management, Mr. Aylesworth at the same time took a strong stand against foreign management.

The officers elected for the coming year are: President, L. B. Herrington, Louisville; first vice-president, John Stoll, Lexington; second vice-president, W. H. Barton, Newport; treasurer, P. S. Pogue, Louisville; secretary, E. F. Kelly, Louisville.

New Louisiana Public Utility Laws

UNDER Section 27, Article 3, of the new Constitution of Louisiana, the following acts of the extraordinary session of the Legislature will become operative Dec. 9, 1921: No. 63, making it unlawful to use fraudulent means in securing electric current and gas through meters; No. 80, authorizing municipalities to mortgage their utilities; No. 93, investing rate-making power in the New Orleans Commission Council; No. 94, authorizing the Commission Council to grant indeterminate permits to utility corporations.

President Nichols of Massachusetts "Tech" Resigns

DR. ERNEST FOX NICHOLS, who was inaugurated president of the Massachusetts Institute of Technology last June, succeeding the late Dr. Richard C. Maclaurin, has resigned on account of ill health. Immediately after being inducted into office Dr. Nichols was overtaken by a severe illness which precludes his assumption of the arduous duties of his new post, though in due course he expects to be able to return to the field of physical science research. A leave of abscence to Jan. 4, 1922, has been granted him by the executive committee of the institute corporation, at which time his resignation will be regretfully accepted. Dr. Elihu Thomson, chief consulting engineer General Electric Company, Lynn, Mass., will again assume the chair of acting president, and the direction of the institute's affairs until a new president is inaugurated will be carried on by a faculty administrative committee consisting of Prof. Henry P. Talbot, head of the department of chemistry and acting dean; Prof. Edward F. Miller, head of the department of mechanical engineering and chairman of the faculty, and Prof. Edwin B. Wilson, head of the department of physics. A biographical sketch of President Nichols was published in the ELECTRICAL WORLD on page 849, April 9, 1921.

First Sections of "Electrical Salesman's Handbook" Now Ready

ANNOUNCEMENT is made by the "Electrical Salesman's Handbook" committee of the Commercial National Section of the N. E. L. A. that the first two units of the new handbook are ready. These sections are those entitled "Industrial Lighting" and "Lamp Equipment for Commercial and Industrial Lighting." They are punched to fit the old handbook covers and may be had from the committee at 50 cents each. As soon as practicable the remaining sections of the handbook will be revised and issued in the new form.

Executive Board of American Engineering Council Adopts New Plan

A NEW plan of regional activity for the Federated American Engineering Societies has been adopted by the executive board of the American Engineering Council and is now being put into effect. It is expected to become effective by Jan. 1. By the new method, which provides for an increase of districts from six to eight, districts are arranged on the basis of unity of local interest rather than on parity in numerical membership. The districts will be as follows:

District No. 1.—New England and New York: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut and New York.

District No. 2.—Great Lakes: Michigan, Wisconsin and Minnesota.

District No. 3.—Ohio Valley: Ohio, Indiana, Illinois and Kentucky.

District No. 4.—Middle Atlantic States: Pennsylvania, New Jersey, Delaware, Maryland, Virginia, West Virginia and District of Columbia.

District No. 5.—South Atlantic and Gulf States: North and South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana and Tennessee.

District No. 6.—North Mississippi and Missouri Valley; Iowa, Missouri, Kansas, Nebraska, North and South Dakota, Wyoming, Utah and Colorado.

District No. 7.—South Mississippi Valley and Gulf: Oklahoma, Arkansas, Texas, New Mexico and Arizona.

District No. 8.—Pacific Coast: Washington, Oregon, Montana, Idaho, California and Nevada.

Kern River Company Forfeits Right-of-Way Under Supreme Court Decree

A DECISION of the United States Supreme Court handed down Nov. 21 in a suit against the United States by the Kern River Company, which appealed from a verdict of the Circuit Court of Appeals, entails the forfeiture by the Kern River Company of a right-of-way for a canal several miles in length through a California forest reserve and also enjoins the appellant from further occupying or using the land unless within some reasonable time, to be fixed by the district court in which suit by the United States against the company was first brought, unless it applies for and obtains a right or license under an act of Feb. 15, 1901, or some other applicable statute.

The litigation began when a suit in equity was brought by the United States to obtain (a) a cancellation of the Secretary of the Interior's approval of two maps on the ground that it was obtained fraudulently by falsely representing that the right-of-way was sought with irrigation as the main purpose and the development of electric power as a subsidiary purpose, when in truth the latter was the sole purpose, or (b) a judicial declaration and enforcement of a forfeiture of the right-of-way on the ground that, although granted on condition that it be used mainly for irrigation, it in fact has been used solely for developing electric power and its use for irrigation is precluded by a binding and continuing agreement on the part of the grantee.

The trial court concluded that the charge of fraud in procuring the Secretary's approval was not sustained, and the bill was accordingly dismissed. On appeal by the United States, the Circuit Court of Appeals concluded that the charge of fraud was adequately proved, and the decree of dismissal was reversed with directions that a decree be entered canceling the Secretary's approval and also enjoining the further maintenance of the canal unless within a reasonable time the claimants applied for and obtained a lawful permit or license, which it was conceded could be done under the act alluded to above.

The Supreme Court has now maintained the decision of the Court of Appeals, with slight modifications.

Administration Not Inclined to Hurry Tariff Bill

IN THE course of an address before the Fifth Avenue Association in New York on Nov. 15 Will H. Hays, the Postmaster-General, made significant references to the tariff situation. His utterance, in some quarters at least, is interpreted to mean that there will be no effort to hurry the enactment of the tariff bill. An extract from Mr. Hays' speech is as follows:

Before 1914 we were a debtor nation—the largest in the world. Today we are precisely the opposite. We are the largest creditor nation in the world. Just what is the effect of the enormous importance of this change in our economic and commercial position in relation to the rest of the world I do not pretend to know. I merely point out that no thorough or open-minded or candid consideration of the tariff question can be complete without including consideration of this new factor. Regardless of what an investigation of this point might reveal—omitting this factor altogether—it is a fact that to thoughtful men there must be approval of a certain hesitation and disposition to be cautious and a determination to be sure-footed in the consideration of the whole subject of the tariff. Conditions throughout the world are so chaotic that it is difficult to foretell exactly what is needed. The very basic conditions on which a tariff is built—the cost of manufacturing in various European countries with relation to our own cost of manufacture and the value of the currency of the various European countries with relation to the value of our own currency—are at the present moment as fluctuating as quicksand. To build a dependable tariff on such a foundation is difficult, of course. It has been thought by many that we could overcome these handicaps by a device which is called American valuation and which would provide that all customs duties shall be estimated upon the value of goods at the time when they arrive in the United States and in terms of American money. The Congress in a proper eagerness for information has made an appropriation of $100,000 to investigate the device and otherwise determine what might be done to help us toward writing a permanent tariff. This was proper, but a much better arrangement, and one which is very definitely in the mind of the administration for accomplishment, is to make the Tariff Commission a really useful and functioning institution which will constantly study the situation and with sufficient authority, which ought to be given it, be able to meet any and all conditions that obtain or emergencies that may arise. The work of the special investigation has been going on, and with the adjustment of our international relations by the accomplishment of the steps which the President has in mind we may except relief from some of the conditions of fluctuation and instability so that proper permanent tariff making will be possible.

Seattle Municipal Plant Bonds at Less than Six per Cent

A SYNDICATE is offering a new issue of $3,205,000 Seattle (Wash.) municipal light and power 6 per cent gold bonds dated Nov. 1, 1921, and due Nov. 1, 1927 to 1941, to yield according to maturity about 5.65 per cent to 5.75 per cent. The bonds are exempt from all federal income taxes and all taxation in the State of Washington. The issue is to make additions to the existing system and for the Skagit River plant construction.

Important N. E. L. A. Executive Committee Meeting Dec. 14

THE midyear meeting of the National Executive Committee of the National Electric Light Association is to be held in New York on Dec. 14. Representatives are expected to be present from all of the divisions. A number of very important matters are to be taken up at that time, including a decision on the date and place of the next annual convention.

Finance to Be Sole Theme of O. E. L. A.'s New Business Committee

FINANCIAL problems of central-station companies are to be the only subject of the meeting of the new-business co-operations committee of the Ohio Electric Light Association to be held at Dayton on Wednesday, Dec. 7. At the morning session J. R. Edwards, vice-president Fifth-Third National Bank, Cincinnati, will read a paper on "Public Utility Financing"; W. W. Freeman, president Union Gas & Electric Company, Cincinnati, will make an address on "Relation of Utility Rates to Price of Other Commodities," and a general discussion will be opened by C. H. Howell, vice-president and general manager Ohio Service Company, Coshocton. In the afternoon there will be two papers followed by a round-table discussion. The subjects of the papers are "Methods of Central-Station Financing—the State Commission" and "The Organization and Work of the Central Station Securities Department," the first to be presented by Grover C. Maxwell, Cleveland, former secretary of the Ohio Public Utilities Commission, and the second by C. E. Yacoll, Youngstown, manager securities department, Pennsylvania-Ohio Electric Company.

Steinmetz Tells Why Electrical Industry Will Grow

THE indisputable reason for the future growth of the electrical industry as well as its past development is that a large and reliable supply of energy is an absolute necessity to our present civilization, said Dr. Charles P. Steinmetz in an address before the New York Electrical Society on Nov. 25. Electricity, he maintained, is the best and in most cases the only reliable and economical form of energy. While transportation is the first essential to modern life in that it brings together materials from all parts of the world, energy is next in importance because it must be available to turn the materials into articles for human use. Moreover, transportation itself is now largely dependent on electrical energy. "Just as the railroads seventy-five years ago organized the transportation of materials, so the transmission of energy to turn our wheels and fetch and carry," said Dr. Steinmetz, "is being supplied by the electrical industry. Great factories which make electricity and supply it as other factories supply hats or stoves have come into being. Electrical energy is the only kind that can be easily, economically and simply conducted to the centers where it is needed, whether in small quantities for the vacuum cleaner or the house lamps or in huge masses for great mills and factories. In long-distance transmission the voltage has crept up from 150 volts to 10,000, 30,000, 60,000 and finally 220,000 volts, and, experimentally, we have gone to a voltage of 1,100,000.

"When the first power plants were established in Niagara the question was asked whether electricity could not be sent to New York City. But no one asks that question any more. The reason is that the distance is so great that the electric power finds a market long before the limit of transmission has been reached. There is no economic excuse for transmission over long distances. Instead, a network of interconnected generating and conducting systems is springing up. It has already ignored the boundaries of states, and the laws of different states are already in conflict, so that federal supervision will certainly be needed.

"On our great railroad trunk lines the anachronism of the steam locomotive still exists. But even the layman knows that only the unfortunate financial situation of our railroads makes more extensive electric propulsion impossible. The enormous consumption of coal by the railway must be stopped.

Hartford Company Plans Reduction in Domestic Rates Jan. 1

A VOLUNTARY reduction in the 10 cents per kilowatt-hour rate now charged domestic consumers has been voted by the directors of the Hartford (Conn.) Electric Light Company, to take effect on all bills rendered after Jan. 1 next. The exact amount of the decrease remains to be figured out, but the guiding principle to be pursued is indicated in this utterance of Vice-president Samuel Ferguson, who announces the satisfaction of the management that it is at least possible to lower charges: "In the present case, as in the case of past increases, it has been the consistent policy of the company to do as great a volume of business as possible on as small a margin above cost as possible."

The resolutions passed by the directors made the following stipulations in regard to the revision:

Such revision to effect a reduction in amounts to be paid by domestic users as a class, based upon the business of the past twelve months, of approximately $100,000.

Such revision to be arranged to distribute this reduction as nearly as practicable to domestic customers in proportion to the use made by each customer of the facilities required to furnish service, and without distinction between large and small customers.

And in addition: Be it resolved, that, in order to accommodate those desiring to make a more liberal use of our service, the executive officers are requested to endeavor to provide a means whereby an average customer may obtain not less than 30 per cent more energy without increasing his present bills more than 10 per cent.

Proposal to Develop Colorado River Power for Railroad Electrification

TWO applications for preliminary permits were received by the Federal Power Commission during the week ended Nov. 26. Guy P. Mohler of Needles, Ariz., requests a permit covering a location on the Colorado River in Mohave County, Ariz., and Clark County, Nev. He wishes to erect a series of dams beginning at Pyramid Peak at the lower end of Pyramid Canyon and extending upstream to the proposed projects of the city of Los Angeles and of E. L. Beyard in Boulder Canyon. The available power is estimated to be 316,800 hp., and it is proposed to build a plant of 400,000 hp. installed. The power is for railroad electrification.

Benjamin H. Hardaway of Columbus, Ga., requests a preliminary permit to cover a 1,400 hp. project on Pea River near its mouth for public utility uses.

To Call Meeting to Co-ordinate National Association Effort

BELIEVING that individual organizations and companies making up the electrical industry are being taxed too heavily both in money and time to carry on the activities of the different national associations, the directors of the Society for Electrical Development at its recent meeting considered the advisability of working out some plan whereby co-ordination of the activities of national association might be accomplished to the end that duplication of effort would be avoided. A committee was appointed by Vice-president J. E. Montague, in the absence of President W. W. Freeman, to prepare a call to be sent to every national association requesting that representatives be nominated to meet and discuss the matter. During the discussion the relation between the society and local electrical leagues came up. The directors were of the opinion that it was advisable first to undertake to co-ordinate national effort and afterward national and local efforts.

A further revision in dues was decided upon at the meeting. Authorization was given for the organization of a home economics department.

The office of secretary-treasurer was divided, and Theodore E. Burger was elected secretary, R. F. Paige continuing as treasurer.

New England Utilities Suffer Million-Dollar Storm Damage

ELECTRIC utilities in New England were visited by the worst sleet storm in their history beginning Sunday of this week, and preliminary estimates of damage to overhead lines and loss of revenue exceed a million dollars. Wire service of all kinds from 66,000-volt transmission lines to telephone and telegraph circuits was crippled to an unprecedented degree; thousands of poles and tens of thousands of spans fell under the accumulating weight of ice and tree branches, and under the most favorable conditions weeks will be required to restore even approximately normal service.

The most severe effects of the storm were felt through Massachusetts from Pittsfield to the suburban district west and north of Boston. Maine, New Hampshire and Vermont escaped with minor damage. Connecticut sustained line trouble near New Haven and on the transmission line of the Connecticut Power Company. Rhode Island got off fairly well until Tuesday, when a shift of the storm caused much telephone damage in the Providence-Pawtucket district and considerable service line trouble, with some street-lighting failures, on the Narragansett system in Providence.

Thirty-four cities and towns within a radius of 30 miles of Boston and supplied by the Edison Electric Illuminating Company were almost entirely in darkness Monday night. Twenty-six other places were seriously affected, and in many towns the service was ordered cut off by city officials on account of the danger of crossed wires. Nearly all the Boston Edison substations were alive up to Tuesday night, and in Boston proper very little interruption of service was reported. Suburban hospitals were being supplied with storage-battery and spot-lamp equipments for operating room service, transported through the co-operation of the company. The total losses of this company may reach $100,000.

The New England Power Company was hard hit on its 66,000-volt transmission system, about a dozen A-frame steel towers and some square towers going down in the vicinity of Worcester. Distributing lines of this company fared badly. Its loss on the entire system may reach $200,000. The Worcester Electric Light Company maintained its downtown and underground service satisfactorily, but in outlying residential sections both street and house lighting was severely shattered. Power service was well maintained. The total loss at Worcester will probably not exceed $30,000. Springfield is reported seriously damaged and cut off from telephone communication. The Tenney companies north of Boston sustained heavy line trouble, including the loss of towers on the Salem-Malden-Revere interconnection. Lowell, Lawrence and Haverhill were also in difficulties. The New England Telephone & Telegraph Company sustained damages estimated at $500,000 3,000 poles being down Tuesday.

Merrill Recommends Acceptance of N. E. L. A. Depreciation Proposals

WORD was received by the ELECTRICAL WORLD from its Washington correspondent on Thursday that O. C. Merrill, executive secretary of the Federal Power Commission, recommends the acceptance of the proposed changes in the water-power regulations with respect to depreciation suggested by the National Electric Light Association. A meeting was held on this subject in Washington on Nov. 21, at which time the N. E. L. A., through a committee, outlined its proposals. A full report will be found on pages 1091 and 1092 of the ELECTRICAL WORLD for Nov. 26.

The statement made this week by Mr. Merrill follows:

The committee originally proposed that the existing regulation with respect to depreciation reserves be practically discarded and that an entirely new regulation be submitted in its place. The proposed new regulation would have had the effect of leaving the commission not only without any authority to determine the principles upon which depreciation reserves should be established, but also without any control over the application of such principles except through proceedings in the courts The original proposals have been materially modified so that the committee's final proposals consist in the insertion of two new sections, Nos. 6 and 7, which modify the remainder of the regulation only in its application to state-regulated public utilities. Certain verbal changes are made in other sections largely for the purpose of securing conformity with the new sections and with the amendments proposed to Regulations 12 and 20.

Objection was originally made to the method proposed for accruing depreciation on the grounds, first, that the method was incorrect, and second, that, if correct, it could be carried out by licensees only to the extent permitted by state regulatory bodies. There apparently is considerable difference of opinion among the members of the committee themselves over the proper method of determining depreciation. The method set forth in the regulation is the one followed by many utilities voluntarily and the one required by many of the state commissions as well as by the Interstate Commerce Commission. In its final proposals the committee leaves the principle of determining depreciation intact in the regulation and confines itself to recommendations concerning the application of the principle to licensees that are public utilities subject to state regulation.

If the regulation is altered as proposed, licensees under state regulation will submit to the commission a classification of project property and a statement of the rates and amounts of depreciation which are proposed to be set up on account of such project, such rates and amounts to be those prescribed or authorized by the public utility commission of the state in which the licensee is operating. These rates and amounts will be reviewed by the commission, and if the commission finds that the reserves proposed are not adequate

for the purposes of the act, it will issue an order requiring the creation and maintenance of reserves which are adequate. If the licensee does not set aside the reserves as ordered, it will be necessary for the commission to enforce the order by proceedings in the courts under the provisions of Section 26 of the act. If the licensee is not under state regulation, the general rule of the regulation will apply.

It is recognized that there would be possibilities of conflict with state authorities if the commission should in all cases in the first instance require depreciation reserves to be set up by any specific method. The maintenance of reserves by licensees who are under state regulation is partly dependent upon their authority to do so under such regulation and partly upon their ability to do so under the rates allowed by the state authorities. Failure to set up reserves adequate to take care of accruing losses in service value of operating property in order that rates may be lower or dividends higher secures such results at the expense of depletion of capital assets and at the risk of future financial difficulties. It is, therefore, believed that the method proposed in the regulation is sound in principle and should be enforced in practice in every case except where, under the specific circumstances, it would, for the time being, be manifestly unreasonable to do so.

Unless it be assumed that the acceptance of a license under the regulation now in force would constitute an agreement on the part of the licensee to account for depreciation on the plan set forth in the regulation, the amendment proposed may accomplish the same results as the present regulation, but in a less direct way. The present regulation prescribes a general rule which licensees would be required to follow unless relieved in specific cases by action of the commission. Under the amendment proposed, licensees, if not required by state authority to set up reserves under the rules contained in the regulation, would be under no obligation to do so, regardless of the amount of their earnings or the condition of their reserves, unless and until specifically ordered by the commission; that is, the proposed amendment transfers the responsibility in each individual case from the licensee to the commission.

The amendment will involve more work on the part of the commission than would have been required by the original regulation. It will be necessary to determine in the case of every state-regulated licensee whether the reserves established are adequate for the purposes of the act, since such licensees would be without legal obligation to establish such reserves unless specifically ordered to do so by the commission Furthermore, it will undoubtedly be necessary in some instances to enforce the orders of the commission though the courts and to settle the question of the reasonableness of the rule of depreciation by court proceedings rather than by a contracted agreement with the licensee expressed in the license itself.

Notwithstanding the certainty of increased work for the commission and the possibility of protracted litigation in some cases if the amendment is approved, it is probable that these objections are outweighed by the difficulties which would be involved in fixing an inflexible rule applicable in all cases, or by the uncertainties which would be involved by leaving the matter indeterminate. It is, therefore, recommended that the proposed changes be approved.

First Demonstration of Carrier Current to Railroad Men

THE first public demonstration of the application of carrier current to moving trains was made before railroad men at Schenectady on Wednesday. Representatives of the Pennsylvania and New York Central railroads who are members of the radio committee of the American Railway Association were holding a meeting at Schenectady, and the General Electric Company took the opportunity to show how far it had advanced in its experiments on carrier current.

The demonstration was made from a moving car on the Schenectady street-railway system. Those on the car were able to talk with a substation 3 miles away.

The General Electric Company has been experimenting with the use of carrier current for railroad purposes for a long time. For several months it has been conducting a test on the electrified Chicago, Milwaukee & St. Paul.

Utility Security Yields Still Lower

DURING the month of November the amount of stocks and bonds offered investors by electric light and power companies was $54,900,000, the highest monthly total of the year with the exception of May, when a new record was set with a flotation of $55,375,475. As is shown in the table the number of single issues offered was small, but the record issue of $30,000,000 offered by the New York Edison Company accounts for the increase in volume. The most prominent characteristic of the month's flotation is the exceedingly low rate of return yielded the investor, 6.33 as compared with 7.33 for the month of October and 7.6 for the month of September. Long-term issues again predominate.

The past month brought a decided upturn to the public utility security market, especially in bonds and preferred stock of electric light and power companies. The public demand for this type of security has been very large and is not yet entirely satisfied. Bond merchants state that their shelves are bare of good issues.

Name of Company	Amount of Issue	Period	Class of Security	Purpose of Issue	Rate of Interest	Per Cent Yield	Offered At
United Light & Railways (Mich.)	$2,000,000	10 yr. 7 month	First and refunding mortgage gold bonds of 1912	To retire an issue of notes falling due	5	7.45	82½
Connecticut Light & Power Co.	4,000,000	.....	Cumulative preferred stock	To provide funds for construction and additions and betterments to plants	8	8.16	98
Utah Power & Light Co.	2,000,000	22 yr.	First lien and general mortgage gold bonds, series of "6's due 1944"	.....	6	6.50	94
Kingsport (Tenn.) Utilities, Inc.	150,000	15 yr. 5-month	First mortgage gold bonds, series B	.....	7	7.30	9[illegible]
Alabama Power Co.	5,500,000	30-yr.	First mortgage lien and refunding gold bonds	Provide funds for redemption of secured notes falling due. Reimburse company in part for expe ditures made and to be made	6	6.20	97½
Pacific Gas & Electric Co., (San Francisco)	10,000,000	20-yr.	First and refunding mortgage gold bonds, series B	Improvements and to reimburse treasury	6	6.10	98½
New York Edison Co.	30,000,000	20-yr.	First lien and refunding mortgage gold bonds, series A	.....	6¼	6.10	104½
Electric Bond & Share Co.	$1,250,000	.....	Cumulative preferred stock	.....	6	6.75	89
Total	$54,900,000						

Louisville Electric Home Sold for $15,025.—The electric home at Louisville, Ky., which during its use for exhibition purposes by the Electrical Club of that city was visited by 23,000 persons, was sold at auction for $15,025, the price including all electric fixtures but no appliances.

Manchester (N. H.) Company Discontinues Surcharge.—The Manchester (N. H.) Traction, Light & Power Company has announced that on Feb. 1 it will drop the surcharge of 25 cents on all electric meters in the Manchester and Nashua district that was imposed in war time. The charges for energy will remain the same.

Jersey City Opens "Great White Way."—A civic celebration of the opening of a "great white way" along the southern part of the Hudson County Boulevard was recently held in Jersey City, N. J. The installation comprises eighty-nine 600-watt lamps. Energy for lighting will be furnished by the Public Service Electric Company at a rate approximating 3.65 cents a kilowatt-hour.

Bradford, Pa., Defeats Project for City-Owned Lighting Plant.—The taxpayers of Bradford, Pa., after an intensive educational campaign for and against city ownership of the local lighting plant, recently defeated the proposition by a vote of 1,700 to 117, or about fifteen to one. The specific question voted on was whether or not to bond the city for $112,000 to pay for construction of a new plant.

Lower Lighting Rate for Birmingham Probable.—It is expected that Birmingham, Ala., will have a cheaper electric light rate commencing early in January, 1922. Under the franchise of the Birmingham Railway, Light & Power Company, which furnishes the electric lighting for the city, the rate is to be reduced 0.5 cent a killowatt-hour when the number of electric meters installed shall have reached 22,500. According to J. S. Pevear, president of the company, this number will be reached before Jan. 1.

Municipal Lighting Plant Question Comes Up Again in Milwaukee.—Mayor Hoan of Milwaukee is actively working for a municipal plant to supply energy not only for the street-lighting service but also for commercial purposes. He has addressed a communication to the City Council which is expected to reopen the ten-year fight for the establishment of a municipal plant. In 1910 the voters approved a bond issue for the construction of a plant to supply energy for the street-lighting system, and the Mayor believes that the city is legally free to float this issue, construct a plant and sell the surplus energy.

Oregon Town Votes Against Municipal Plant.—Public opposition to experimenting with a municipal light and power system was manifested in the outcome of a special election held in Roseburg, Ore., last month for the purpose of voting on the issuance of bonds for establishing such a system. Although the city still has the authority to issue $500,000 in bonds and proceed with a new plant by virtue of the result of an election several years ago, it is very doubtful that it will make this move in the face of the recent adverse vote, especially as this amount would probably not be sufficient to build a power plant and the necessary distribution system. The private utility now supplying the city is said to be willing to make any necessary extensions and improvements and the citizens apparently find its service adequate and reliable.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Municipal Councilors Say Utilities Are Paying All the Taxes Their Business Will Bear.—An unusual report to [illegible] made by municipal councilors was rendered recently to the City Council of Butte, Mont., by its ways and means committee. This committee asserted that the local power, telephone and water companies were paying all the taxes and license fees that their industries would bear and that the need of raising additional sums for the administration of the city did not justify imposing still higher taxation on them. The report was accompanied by a statement of taxes paid by these companies, showing the low rate of return they were earning on investment.

Smithsonian Institution Does Not Indorse Plan to "Consolidate Government Science."—Through the publication in the *Congressional Record* of a plan by Arthur McDonald of Washington to consolidate government science in the Smithsonian Institution, wide circulation has been given to a scheme which is not taken seriously in Washington and does not have the indorsement of the Smithsonian Institution. Dr. Charles D. Walcott, secretary of the Smithsonian Institution, says that the plan was drawn up and circulated without his knowledge, and the Congressman who inserted the proposal in the *Record* state that he did so as an accommodation to Mr. McDonald and is opposed to the scheme himself. As a result of the publication of this plan the various scientific bureaus and the Smithsonian Institution have received a flood of comment.

Indiana Utilities Ask Leave to Offer Securities on Better Terms for Purchasers.—Two Indiana public utilities have petitioned the Public Service Commission to permit more favorable terms for purchasers of securities already authorized by the commission. The Interstate Public Service Company, a gas, electric and interurban utility, has requested permission to sell $130,000 of its first and refunding bonds at 75 per cent of par. The commission some time ago authorized the company to sell the securities at 80 per cent of par, but the company avers that it cannot now market the bonds unless it gives a greater discount. The Indiana Power Company of Vincennes has requested leave to increase from 7 to 8 per cent the dividend rate on $1,303,000 of unsold preferred stock. The commission originally authorized the company to issue $1,590,000 of 7 per cent stock, but the company asserts that it cannot now dispose of the remainder unless it pays a higher dividend.

Projected Transmission at 200,000 Volts in Scandinavia.—The project of exporting electrical energy from Norway to Denmark through Sweden continues to receive official consideration in those countries, and an engineering commission not long since visited a number of Norwegian power stations to ascertain their value in carrying out the scheme. Some experts, according to *Engineering*, consider it probable that Norway will deliver power either from power stations on the River Glommen or from Nore and that she will herself undertake the transmission of this power as far as the Swedish border, from which point the further transmission would be undertaken by Sweden. It is proposed to employ a tension of 20,000 volts, which would far exceed any voltage now used in Europe.

Peat and Water Power in Ireland.—At a recent "All-Ireland" industrial conference held in Dublin a speaker estimated the available electrical energy of the country from water power at at least five times that now developed by imported coal. An official fuel research board, this speaker also said, had reported that the peat deposits would satisfy the power requirements of the island for more than 250 years, so that the outlook was very good. The chief electrical engineer of the Dublin Corporation said that the chief trouble with water power in Ireland arose from the variable flow in the rivers. The Dublin authorities were anxious to develop the Liffey, and that river and the Bann would be the first to be exploited. The Shannon and the Erne would produce more power, but there was not a great enough population to make its development profitable.

A New Type of Windmill Motor.—According to a Duluth (Minn.) contemporary, an inventor of that city, Albert H. Heyroth, has attacked from a new angle the problem of generating electricity with the windmill as a prime mover. "He placed around a standard 8-ft. fan a laminated iron periphery having 108 teeth at equal intervals. This periphery was made rigid to the fan. With the movement of the fan it was made to pass under what might be termed the armature coils of a stator. This stator, which is supported above the fan by a post set in the turntable and which consists of two sets of coils, is covered with a copper housing and sealed. With increasing and diminishing of the magnetic flux through these coils by the passage of the teeth, an alternating current is set up. This is rectified in a vacuum tube and charges the battery and supplies the excitation to the field coils of the stator, which are excited by a current from the batteries until the plant begins charging." Mr. Heyroth designs his apparatus for a suburban home or a farm with small electrical requirements. According to the newspaper, the first plant he erected supplied all the energy required by the home to which it belonged for a period of more than four months. The operation of the plant for three hours a day was found sufficient to replace all the energy which had been taken from the batteries during the previous twenty-four hours. Charging began with wind at five miles an hour. Sixteen cells provided this home, which is equipped with all the electrical appliances, with enough energy for ninety hours with no operation of the plant.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Powers of Florida Commission.—Quashing an alternative writ of mandamus sought by the Railroad Commissioners (State ex rel. Burr) against the Jacksonville Terminal Company to compel the company to comply with certain orders of the commission concerning the checking of baggage, the Supreme Court of Florida has declared that authority not granted by a corporate charter or by the law cannot be conferred by an order of the commission. (89 So. 641.)*

Value of Franchise Determined by Earning Capacity.—In a suit brought against the Louisiana Board of State Affairs by the Baton Rouge Electric Company to reduce the assessment of the company's franchise from $452,530, as fixed by the board, to $67,375, the Louisiana Supreme Court held that the board was not justified in adding to the earning value of the franchise an additional assessment for the privilege of occupying the streets or for carrying on the business of the corporation, since the value of the franchise is to be determined by earning capacity. The court held further that a public utility corporation the franchise of which is assessed according to the net earnings rule is entitled to have deducted from its annual earnings the estimated annual cost of replacements or renewals of its tangible property used in the business. (89 So. 244.)

Pennsylvania Courts Bow to Supreme Court of United States.—The case of Ben Avon Borough vs. Ohio Valley Water Company, which began before the Pennsylvania Public Service Commission nearly five years ago, has finally come to a conclusion. In this case a decision was originally rendered by the commission greatly decreasing the valuation placed upon the plant by the water company and necessitating, if sustained, reductions in the schedule of rates. The Pennsylvania Superior Court overruled the commission as to five of the items of valuation, the net result of which action would have been to sustain the rates. On appeal the Pennsylvania Supreme Court reversed the judgment of the Superior Court and approved the findings and order of the commission. The judgment was in turn appealed to the United States Supreme Court, which reversed the Pennsylvania Supreme Court (see ELECTRICAL WORLD, Dec. 11, 1920, page 186) upon the ground that the state must provide a fair opportunity for submitting the issue of confiscation by fixing too low a rate to a judicial tribunal for determination upon its own independent judgment as to both law and facts; otherwise, the court of last resort held, the order would be void because in conflict with the Fourteenth Amendment. The Superior Court then proceeded to reconsider the case and again decreed that the order of the commission be reversed and the complaints dismissed. The cause was once more appealed to the Pennsylvania Supreme Court, which now affirms the judgment of the Superior Court and dismisses the appeals. In Beaver Valley Water Company vs. Public Service Commission, the Superior Court had affirmed a similar commission finding out of deference to the ruling of the Pennsylvania Supreme Court in the Ben Avon case. The Superior Court has now, on resubmittal, reversed itself, ordering the commission to dismiss the complaints, and has been sustained by the State Supreme Court. (114 At. 369, 373.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Reasonableness a Factor in Permissible Operating Expenses.—The mere fact that a utility has spent a certain sum of money for operation does not, the Indiana Public Service Commission observed in denying increased rates to a gas company, necessarily mean that that amount must be allowed as an operating expense, if it appears that the expenditure is improper or that it is too large. Moreover, the commission has to remember that excessive rates are likely to result in a falling off of consumption and a consequent failure of financial benefit to the utility.

Fair Value, Not Purchase Price, the Criterion. — A North Dakota village having raised the point that the utility serving it had been allowed a valuation on its plant larger than the price it had paid for it, the Board of Railroad Commissioners of that state replied: "If the public is charged only rates based on the fair value of this property as determined by this board after considering all the facts, then the public has no complaint. If the utility has paid more for the property than it is worth, that is the utility's fault, and it cannot recoup itself out of the public. If, however, economic conditions and the law have been such as to give the utility the benefit of the bargain, that does not go to the public. The public is concerned only with the fair value."

Ten-Year Average of Prices Used in Figuring Valuation of Electric Utility.—The Indiana Public Service Commission has placed a valuation of $4,346,653 on the Indiana Railways & Light Company of Kokomo for rate-making purposes. The valuation is one of considerable importance since rates authorized by the commission will hinge on the value of the property of the company. A ten-year average of prices from 1911 to 1920 was used by the commission in figuring the value of the property. Non-utility property owned by the company, valued at $172,585, was not included in the valuation. The company operates interurban lines, street-railway lines, electric utilities and heating utilities in a number of Indiana cities, including Kokomo, Frankfort and Marion.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

Ohio Electric Light Association.—A meeting of the new-business co-operations committee of this association is scheduled for Dayton on Wednesday, Dec. 7, and one of the transmission and distribution committee for the same city on the following day.

Institute Section Meetings.—Section meetings of the A. I. E. E. for this month are scheduled as follows: Dec. 6, Toronto, "Distribution Records and Overhead Distribution"; Dec. 8, Baltimore, "Design and Construction of the Westport Generating Station," by A. S. Loizeaux, and "Operating Problems in the Westport Generating Station," by A. L. Penniman; Dec. 14, New York (joint session with A. S. M. E.), "Central-Station Operation."

N. E. L. A. National Section Meetings.—January meetings of the National Electric Light Association sections are scheduled as follows: New Orleans, Commercial National Section—Jan. 18, 10 a.m., Lighting Sales Bureau and Power Sales Bureau; Jan. 18, 2 p.m., Electric Vehicle Bureau and Merchandise Sales Bureau; Jan. 19, 10 a.m., Advertising and Publicity Service Bureau and education committee; Jan. 19, 2 p.m., committee on commercial service and relations with customers, committee on "Electrical Salesman's Handbook" and committee on electrically equipped furniture; Jan. 20, 10 a.m., executive committee. New York City, Technical National Sectional (all meetings at 10 a.m.)—Jan. 23-24, inductive interference committee, meter committee and underground systems committee, main groups; Jan. 25-26, electrical apparatus committee, overhead systems committee and hydraulic power committee, main groups; Jan. 26-27, prime movers committee and safety rules committee, main group.

Coming Meetings of Electrical and Other Technical Societies

A. I. E. E. Section Meetings—Baltimore, Dec. 8; New York, Dec. 14.

A. I. and S. E. E.—Cleveland Section, Dec. 12; Chicago Section, Dec. 16; Pittsburgh Section, Dec. 19; Philadelphia Section, Dec. 20.

American Society of Mechanical Engineers—New York, Dec. 5-9.

American Society of Refrigerating Engineers—New York, Dec. 5-7.

American Institute of Chemical Engineers—Baltimore, Dec. 6-9.

American Physical Society—Toronto, Dec. 27-30.

American Association for the Advancement of Science—Toronto, Dec. 27-31.

American Engineering Council — Washington, Jan. 5-6.

Western Association of Electrical Inspectors—Chicago, Jan. 17-19.

American Society of Civil Engineers—New York, Jan. 18-19.

Lighting Fixture Dealers' Society of America—Milwaukee, Jan. 30-Feb. 2.

National Meter Committee, N. E. L. A.—Springfield, Ill., Feb. 15.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

E. N. Willis, who has recently been appointed secretary of the Southwestern Electrical and Gas Association, vice H. S. Cooper, resigned, comes to his new position after ten years of close

E. N. WILLIS

touch with the public utilities throughout the Southwest from both a commercial and an operating standpoint. Mr. Willis was born in St. Lawrence County, New York, in 1880. He was graduated in electrical engineering from Lawrence Scientific School, Harvard University, in 1903. He was connected with the General Electric Company in Schenectady, in the testing department and as construction engineer, from 1903 to 1911, when he went to Dallas to join the General Electric Company of Texas, later the Southwest General Electric Company, as assistant to the sales manager. In 1919 he became manager of the Houston office for Smith & Whitney, power-plant engineers. Mr. Willis is well acquainted with public utility problems and men throughout Texas and the Southwest and is well qualified for his new work with the Southwestern association.

Dr. Ernest Fox Nichols, who upon the advice of physicians recently resigned the presidency of the Massachusetts Institute of Technology, is to return to Cleveland to resume the directorship of the Laboratory of Pure Science maintained by the National Lamp Works of General Electric Company, Nela Park. This position he left previous to his inauguration as the president of the institute on June 8, last. Because of ill health Dr. Nichols never actively assumed his office. In his work at Nela Park Dr. Nichols' time will be more nearly at his personal disposal. Dr. Nichols is widely known in the educational and scientific world. He has done much scientific research work concerning light, and his calculation of the pressure of light upon the earth is accepted universally. A short time before leaving Cleveland he perfected apparatus for measuring the heat of the stars. From 1909 to 1916 Dr. Nichols was president of Dartmouth College. He has also held professorships at Colgate, Yale and Columbia universities and has studied at Kansas Agricultural College, Cornell University, the University of Berlin and Cambridge University.

Harry C. Abell, formerly vice-president and engineer of the American Light & Traction Company and a member of the firm of Emerson McMillin & Company, has been elected a vice-president of the Electric Bond & Share Company. Mr. Abell has taken an active interest in the activities of the N.E.L.A. for a number of years and is at present treasurer.

Albert W. Childs, superintendent of sales of the Southern California Edison Company, has just been elected chairman of the advisory committee of the California Electrical Co-operative Campaign, with L. H. Newbert as vice-chairman. Mr. Newbert, who is manager of the East Bay Division of the Pacific Gas & Electric Company, had been chairman of the committee since its inception in 1918. Mr. Childs was born in Milwaukee, Wis., in 1870, whence he moved to Los Angeles in 1886 and received his early business training in real estate and fire insurance. He entered the employ of the Southern California Edison Company in March, 1902, serving successively as cashier, district manager in four of the most important districts, assistant general agent and superintendent of sales. He was promoted to the last position in 1913. Mr. Childs has long been active

A. W. CHILDS

in electrical affairs on the Pacific Coast. He has served on numerous committees of the National Electric Light Association, including the chairmanship of the Pacific Coast Division commercial committee. He has been a member of the Co-operative Campaign committee since October, 1918, and is thus well qualified to carry on the constructive work of this committee.

H. C. Hasbrouck, for many years associated with the old Public Service Commission of New York, Second District, as head of the accounting and statistical department, has resigned from the new commission to become associated with H. C. Hopson in New York on matters of finance, accounts, taxes and public utility rates. Mr. Hasbrouck is a native of Troy, N. Y., and received his early education in the public schools of that city. After his graduation from Cornell University, where he specialized in economics, history and

H. C. HASBROUCK

political and social science, he served for a time as assistant to the registrar of that institution. In July, 1908, he received an appointment as junior statistician with the then recently organized Public Service Commission for the Second District and had remained with that body and its successor in various capacities ever since. In 1913 charge of the commission's division of statistics and accounts was given to him, and he continued to perform the duties of that position until the reorganization of the public service commissions in July last. When the two commissions were consolidated Mr. Hasbrouck became deputy chief accountant of the commission, in immediate charge of the accounting and statistical work of the Albany office, through which most matters relating to finances and accounts of the up-state companies have been handled. Since July 1 he has, therefore, had supervision over most of the work previously done by the division of capitalization and the division of statistics and accounts of the up-state commission.

Mr. Hasbrouck is known to public utility interests outside of New York State by reason of his membership for several years on the committee of statistics and accounts of public utilities of the National Association of Railway and Utilities Commissioners. He was chairman of the special committee of three which prepared the original draft of the uniform systems of accounts for electrical and gas companies which the 1920 committee presented to the national association at its annual convention last year with the recommendation that they be made the basis for uniform accounting in all states.

W. L. Tindall, formerly secretary and general manager of Tindall & White, Inc., lighting bowl manufacturers, New York, has been made president and general manager of the company.

R. J. Wensley, engineer of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, has left for an extended trip through England to study electrical conditions.

C. L. Steber has been appointed the Chicago representative of a St. Louis fuse manufacturer, the Bussman Manufacturing Company. Mr. Steber succeeds J. S. Jacobson, who will devote his entire efforts to his own products.

M. I. Scott, for some time in charge of crane-motor production with the General Electric Company at Fort Wayne, Ind., has been transferred to the Erie (Pa.) works of the company. Crane-motor production in the future will be carried on there. W. H. Kellermeyer is taking Mr. Scott's place at Fort Wayne.

Oswald Dale, formerly vice-president of the Irvington Varnish & Insulator Company, who recently returned from Europe, has been appointed general manager of the Pittsburgh Insulating Company, Pittsburgh. Mr. Dale while in Europe made a study of the English and French insulating material markets.

C. A. Cotton, well known in the New England electrical field as a motor sales representative with headquarters at Boston, has established offices in that city in his own name. He will represent the Northwestern Manufacturing Company of Minneapolis, builder of direct-current and alternating-current motors, and the Sunlight Electrical Manufacturing Company of Warren, Ohio, manufacturer of fractional-horsepower split-phase motors in the New England territory with headquarters at 100 Pearl Street, Boston.

E. J. Mora, until recently engineer and manager of the electrical department of the Pacific Commercial Company, Manila, P. I., the agent of the General Electric Company, has entered into partnership in that city with A. G. Hillberg, C. E., under the firm name of Hillberg & Mora, electrical engineers and contractors. Mr. Mora for a time was connected with the Johns-Manville Company and the West Pennsylvania Railway Company as electrical engineer. Mr. Hillberg was associate editor of the *Engineering Record* for a number of years. He has devoted considerable time to the study of hydro-electric development.

Fred B. Uhrig, for the past forty years an employee of the Western Electric Company and widely known in electrical circles, has retired from active service. Mr. Uhrig was employed by the Western Electric Company as an office boy in Chicago in 1881. By 1883 he had become editor and service man and in 1895 credit man of the Chicago office. When the Denver branch was opened, in January, 1903, Mr. Uhrig was chosen as its manager. The following year he went to Kansas City as manager of the distributing branch there, and with the exception of a short period in 1909 in St. Louis, he has ever since been manager at Kansas City and Western district manager. He has contributed much to the development of his company's business in the Southwest between the Mississippi and the Rockies.

W. T. Cotter, for the past ten years manager of the Davenport (Iowa) branch of the Crane Company, has been appointed manager of the Omaha (Neb.) branch. The appointment takes effect on Jan. 1. His successor at Davenport has not yet been appointed.

E. E. Aldous has been appointed the representative of the American Steel & Wire Company for the Duluth, St. Paul and Minneapolis territory. Mr. Aldous has been in the service of the company for twenty years. He will have his headquarters in St. Paul.

F. T. Coup, until recently in charge of the Milwaukee office of the Wagner Electric Manufacturing Company, St. Louis, has been appointed district manager in charge of the Cincinnati office of the company. Mr. Coup is well known in the trade, having been connected with the Wagner company for many years.

S. N. Clarkson, consulting engineer of St. Louis and former associate Western editor of the ELECTRICAL WORLD, has been selected as permanent secretary of the Power Club, with headquarters at 506 Laclede Gas Building, St. Louis, Mo. Up to the present time the duties of secretary have been performed by one of the members. Of late years C. H. Roth, of Roth Brothers & Company, has given a very large amount of time and effort to this work. Now the activities of the organization have grown to the point where they require more of the secretary's time than it is felt any one member should be asked to give. Mr. Clarkson brings to the Electric Power Club a wide commercial and engineering experience in the manufacturing, central-station and industrial branches of the electrical industry in addition to a broad conception of the entire industry and a wide acquaintance gained in the two years he was a member of the editorial staff of the ELECTRICAL WORLD. Mr. Clarkson was educated in Australia and came to this country seventeen years ago. He has been connected with the Westinghouse Electric & Manufacturing Company, the Union Electric Light & Power Company

S. N. CLARKSON

of St. Louis and the Milwaukee Electric Railway & Light Company. A detailed account of his activities in the electrical industry appeared in the ELECTRICAL WORLD for March 12 last, on page 622.

Benjamin P. George, who has just been re-elected president of the Electrical Credit Association, Central Division, has been the recipient of many honors at the hands of the credit men of the electrical industry. In 1919 he was elected president of the national body. For five years previous to that he had served the Central Division of the body as its representative on the board of the national association. At the 1920 meeting of the Central Division he was made president, the post to which he has been re-elected. Born in Concord, N. H., in 1862, Mr. George was graduated from Dartmouth College in the class of 1884, and ever since that time virtually all of his activities

B. B. GEORGE

have been along credit or financial lines. He was interested in credit matters for about fifteen years before he became closely connected with the electrical industry as credit manager for the Beardslee Chandelier & Manufacturing Company in 1908. Mr. George is still responsible for the credit policy of that company, although in 1917 the additional responsibility of being its treasurer was given to him.

Obituary

James Healey, special sales engineer of the Mutual Electric & Machine Company, Detroit, Mich., died on Nov. 15, from pneumonia, at the age of sixty years. Mr. Healey was prominent in the electrical field, particularly in the vicinity of Detroit and Chicago. He was formerly associated with the American Telegraph & Telephone Company and had traveled extensively all over the world.

Timothy J. Lynch, for about thirty years superintendent of the Danvers (Mass.) municipal electric lighting department, died recently at Salem, Mass., as the result of a street-railway accident. He was about sixty-four years of age. The Danvers plant was one of the first municipal installations in the country. About two years ago it was converted into a substation from which energy is distributed by the department after purchase from the Eastern Massachusetts Electric Company, operating the Salem-Malden interconnection.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Better Feeling Continues in Motor Market

ALTHOUGH the road to full recovery still appears long in the motor market, there is an improved tone to both inquiries and orders where persistent sales effort has been shown, as recently noted in these columns. Unless something foreseen occurs, the opinion of well-informed circles is that a gradual strengthening of demand will persist during the winter and that by next fall extremely active conditions will be realized compared with present sales. During the past few months good progress has been made in filling orders from factory and distributers' stocks, and yet this has not been done to an extent that has curtailed factory production beyond the clearly evident necessities of the market. Factory production has been called upon to an extent little appreciated to fill such orders as have been received, and while the publication of ratios is not authorized, it may be said that on many orders more than two-thirds of the units required have been lately fabricated in the manufacturing plants.

Labor conditions tend to improve as liquidation proceeds; raw materials are plentiful, and production plants are being tuned to the most efficient pitch allowable in relation to the scale of present business, at least in the more progressive concerns. Best of all, the underlying gains in general business, while not spectacular, are imparting more encouragement to industry, and the latent market for motorization is far from developed. With many other constructive activities it bids fair to expand if the hoped-for agreement to limit arms is adopted by the Washington conference.

Insulated-Wire Raw Materials Reaching Higher Price Levels

SEVERAL of the raw materials used in the manufacture of insulated wire have reacted from their previous low price levels and have started to climb once more. In some quarters the rise in price of rubber is thought to have been a trifle too rapid, but a recession to the extremely low prices of sixty days ago is held to be unlikely.

Within the last sixty days rubber has shown decided strength, and the present prices are approximately the same as those prevailing around the first of the year. The question of further advances depends entirely upon demand, and there is little reason to conclude that demand can increase very largely for several months, so that prices may be expected to remain stationary for the time being. There are good stocks of insulated wire, and even if this were not so the total percentage of rubber production consumed by the wire industry is not large. On the other hand, large manufacturers of automobile tires have announced radical reductions, and there is a feeling that this might stimulate enough demand for rubber to keep prices at today's levels. The proposal of the rubber growers to stimulate the market by limiting production according to advices has met with failure through lack of co-operation, but many are holding for higher prices. Up-river, fine, was quoted at 24 cents on Nov. 23, first, latex crepe, at 18¾ cents, and ribbed smoked sheets at 18¾ cents per pound, an increase since Nov. 1.

While the cotton market has been irregular, prices are still well up. The weakness was derived in great part from English influence, and this has somewhat worn off. Large spinners' takings for the past week have been high, and the fact that they have taken not only 1,700,000 bales more since Aug. 1 than last year, but also 900,000 bales more than during the active period of 1919, has had a decided influence on sentiment. Cotton-yarn prices closed for October somewhat off from maximum, but there is little likelihood of their declining any considerable amount, enough at any rate to bring them down to the low levels of four or five months ago. As long as the raw-cotton market continues to win back to normal a strong cotton yarn market is naturally to be expected. So far higher cotton has not entered greatly into governing the price of insulated wire and insulating material, but this is due mainly to small demand for the products themselves.

Copper, the most important of the raw materials in this product, has been strong since the beginning of September, with only an occasional slump. There are a number of authorities who predict 15-cent copper by spring, and this forecast seems to be justified by the willingness of buyers to cover their needs for the next six months.

Signs of Improvement in Export Credit Situation

THE foreign exchange situation has ceased to be the bugaboo of six months ago, according to statements made by L. R. Browne, credit manager of the International Western Electric Company, in a talk last week before the National Association of credit men at their monthly "foreign credit round table." With the exception of the Far East, Mr. Browne remarked, where the depreciation of silver has been an impediment, and a few countries in South America, the buyers are showing more faith in the future.

"Mexico in particular has staged a buying 'comeback,'" he said; "our neighbor to the south is in the field for almost every type of supply. The same promising conditions are noticeable in Colombia and Peru. While the demand as yet is a modest one compared with the pre-slump period, history will prove that it is the very stuff of which all great buying movements are made. Some of the South American countries have used the cotton boom to relieve their financial troubles. They also deem it expedient to swallow the difference in exchange rates now existent, under the impression that by the time deliveries are completed on their new orders the money market will have displayed a still better tendency in their favor. Another hopeful sign is the movement among merchants of Mexico, Cuba, Venezuela and Colombia gradually to settle up overdue accounts. Exporters are finding many of their foreign clients ready to accept the exchange losses and balance up their books. Cuba is particularly active in this respect."

An increase in trade with the Far East may be expected soon, according to Mr. Browne, as silver bullion has appreciated more than 12 cents an ounce.

Prices on Western Red-Cedar Poles Drop

A GENERAL decrease in the delivered price of western red-cedar poles has been put into effect by a number of the largest producers. A 40-ft. pole, 8-in. top, may now be bought in New York in carload lots at $16.15. The former price was $19.10, so that the drop on this size is about 15 per cent. Quotations on other sizes f.o.b. New York are as follows: 40-ft., 7-in., $14.35; 35-ft., 8-in., $14.10; 35-ft., 7-in., $11.85; 35-ft., 6-in., $9.55; 30-ft., 7-in., $8.55; 30-ft., 6-in., $6.80; 25-ft., 7-in., $6.80; 25-ft., 6-in., $5.05. The decrease all down the line averages about 15 per cent.

This move of the producers came somewhat unexpectedly

even to those closely connected with the industry. Producers had declared that there was little basis for a reduction until freight rates were cut, and for that reason few looked for a drop until after the first of the year. However, there are large stocks on hand, and it is thought that the move was made in order to get these stocks out of the way by inducing a buying movement. So far, it was stated by one large producer, the drop has not had a great deal of effect on demand. There is a fair amount of new construction in most parts of the country, together with the usual amount of repair and maintenance work. Manufacturers of high-tension apparatus report good sales in rural territory, and this indicates that farm lines are going ahead. Much of this business centers in the Middle West.

Wire Shows Inclination to Follow Copper Market

DURING the past week both weatherproof and bare wire have become firmer in many parts of the country, jobbers quoting ½ cent a pound higher than last week's base prices. In other centers prices are somewhat spotty, with some jobbers high and others low. Discounting the size of stocks, an increase in wire prices has been looked forward to since the activity of the copper market started in September. Whether this rise in wire is a flurry or not, authorities take it to signify approaching recovery of the market.

Boston reports an advance by jobbers of ½ cent on weatherproof, which is now at 16 cents per pound. Storm damage in that section is expected to increase demand there, though at the beginning of the week the properties damaged were making repairs chiefly out of stock. In Atlanta there has been an equal advance on both bare and weatherproof. The orders there are reasonably good on Nos. 4 to 8 inclusive, and stocks are large. St. Louis jobbers are quoting 15 and 15½ cents per pound on bare and weatherproof respectively. Demand is dull, with stocks heavy. Chicago and New York jobbers are at variance on prices, though the majority seem to be sticking to the old figure.

So far rubber-covered has not followed the lead of bare and weatherproof. Prices vary a great deal, though jobbers' quotations even in the same city varying as much as 60 cents per 1,000 ft. of rubber-covered No. 14. The trend of the copper market, however, is forcing all copper products higher, and to this rather than demand may be laid wire increases.

Continued Improvement Shown in Collections and Credits

IT IS reported by a large electrical jobber that the average basis of collections for the whole country has been reduced about five to six days. On the first of November collections were averaging almost exactly sixty days, while at the present time they are between fifty-four and fifty-five days. Much of this improvement is ascribed to a general reduction in interest rates, with the resultant easier money market, and to generally improved basic conditions.

At the present moment the Northwest is perhaps the worst spot. In North and South Dakota there have been many bank failures, and this, coupled with low prices of farm products, has brought the average of collections higher there than in any other part of the country.

In the Southeast conditions run about the same as last month with flashes of further improvement showing here and there. Collections range from fifty to sixty days, with the average close to fifty.

The general improvement in the southern and central sections has materially bettered credit and collection conditions for jobbers in the Middle West and Southwest. Current obligations are being met within thirty to sixty days, but there remain a quantity of long-term obligations which have been standing for as much as a year. The latter, however, are being steadily liquidated. In the more northern states collections are on an average of forty-five days, all obligations considered. However, these results are not being obtained without considerable work on the part of credit managers. Credit conditions generally are on a much sounder basis and more liberal purchases are being permitted.

The Intermountain district shows some improvement. However, taxes there are felt to be very high, and this is retarding collections. There seems to be plenty of money for investment, however, and this is an encouraging fact. Credits are being well scrutinized.

Pacific Coast collections are a shade better, although during the past month a number of firms have been forced to reorganize. New credits there are being very jealously watched and very few are reported.

Collections in New England are slightly better than last month, and while considerable variation exists between different jobbers' conditions, a more optimistic feeling is evident. Current payments are being made in about sixty days, though here and there outstanding accounts are running a little longer. The three months' period seems to have yielded to better business, and a maximum of seventy-five days represents about the most unfavorable condition. In some cases the tendency to obtain cash discounts for prompt payment is more evident. On the whole, the outlook is good.

New York collections are running about sixty days. Conditions are practically the same as last month, except that the outlook is brighter.

Metal Market Situation

THE copper market is running along steadily with a good amount of business and numerous inquiries. Many of the large producers have already sold the amount of copper set aside for 1921 and have withdrawn from the market as far as deliveries over the balance of the year are concerned. The only month they are quoting is January, at 13¾ cents per pound, as against 13⅝ cents a week ago.

Domestic demand continues good, while foreign buying has been somewhat weak during the last few days. However, taking last week as a whole, European and Japanese buying has been good, with Germany buying about two-thirds that taken by Europe. French buying has been fairly good and Italy has been taking electrolytic and blister in moderate amounts. Domestic brass mills are finding December business holding up well.

Lead is featured by a firmer market abroad, London cables being 7s. 6d. higher for spot at £25 17s. 6d. The domestic situation is quiet, though this is largely seasonal and indications point to a strong revival of demand in the spring.

It became known earlier in the week that the Aluminum Company of America had reduced its quotation on 98-99 per cent ingots from 24.50c. to $19.00c. per lb. with corresponding reductions on other grades. These reductions went into effect on Nov. 15 but were not announced until Nov. 28.

NEW YORK METAL MARKET PRICES

	Nov. 21, 1921	Nov. 28, 1921
Copper	£ s d	£ s d
London, standard spot	66 7 6	67 7 6
	Cents per Pound	Cents per Pound
Prime Lake	13.37½—13.50	13.50
Electrolytic	13.25	13.50
Casting	12.50—12.62½	12.87½
Wire base	14.75—15.00	14.75—15.00
Lead, Am. S. & R. Co. price	4.70	4.70
Antimony	4.55	4.55
Nickel, ingot	41.00	41.00
Sheet zinc, f. o. b. smelter	9.00	9.00
Zinc, spot	5.15	5.15
Tin, Straits	29.75	30.00
Aluminum, 98 to 99 per cent	24.50	19.00

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	10.50 —11.00	10.50 —11.00
Brass, heavy	5.00 — 5.25	5.00 — 5.25
Brass, light	4.75 — 5.00	4.75 — 5.00
Lead, heavy	3.75 — 4.12½	3.75 — 4.12½
Zinc, old scrap	2.50 — 2.75	2.50 — 2.75

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

BUSINESS in strictly electrical circles during the past week has been on an even keel, just as it has been through the whole month of November. However, for all its lack of high spots, the month will exceed October in sales, according to large New York jobbers. Other cities have had virtually the same sort of business. From now on orders may be expected to drop off a little as inventory time approaches. Reports from various sections indicate that holiday business expectations are subsiding a trifle. Still, there is the chance that this season may surprise the pessimists just as did last season.

General industrial conditions are improving. St. Louis reports several steel mills on full schedule, while the same thing is noticed in Atlanta. Textile conditions in New England are good. Electrical supplies are moving well, although a widely diversified demand is shown by different sections of the country. Radio receiving sets are selling heavily in Chicago on account of the broadcasting of grand opera there. In Massachusetts and in the Pacific Northwest overhead line supplies are in demand on account of storm damage.

There is considerable agitation in the Intermountain region over the reduction of through freight rates from the East to the Pacific Coast without a corresponding decrease in the rates to intermediate points in the district. Jobbers there fear this situation will seriously affect business.

NEW YORK

Electrical business seems to have held its own during the month of November, and while actual figures are not yet available, most jobbers feel confident that October sales have been exceeded. The demand for wiring material continues on an even keel with individual orders slightly increasing in the quantity per order. Prices remain virtually the same as last week, with perhaps a little stiffening in wire prices, although this is offset by large stocks carried by some jobbers.

Heating appliances and other household devices are moving better and holiday orders are more plentiful. The trade, however, has been inclined to go slow on ordering large stocks, preferring, it seems, to take chances on a shortage rather than be overstocked.

Conduit.—Prices remain at about the same levels as last week. The smaller sizes are moving fairly well, and jobbers state that buying is in a little larger quantities. Jobbers quotations this week were as follows: For ½-in. black pipe in 2,500-ft. lots, $48.90; ¾-in., $62.70, and 1-in., $89.32 per 1,000 ft. Galvanized pipe in the same sizes was quoted at $53.97, $69.58 and $99.47 per 1,000 ft. Jobbers stocks are good in nearly all sizes.

Rubber-Covered Wire.—Although there have been considerable increases in the costs of raw material, jobbers' prices remain virtually where they were last week. In 5,000-ft. lots, No. 14 rubber-covered is quoted at $6.50 to $6.77 per 1,000 ft. Demand is fair and some jobbers have large stocks on hand.

Flexible Armored Conductor.—This material continues to move very well. Jobbers have been able to replenish stocks during the past week, and immediate delivery can now be made on moderate-size orders. No. 14, two-wire, single-strip, is quoted at $44.50 to $46 per 1,000 ft. in lots of that quantity. Double-strip is quoted at $46.50 to $48 per 1,000 ft.

Lamp Cord.—No change in price was noted this week and demand is moderate. No. 18, cotton, twisted, sells for $12.90 per 1,000 ft. and parallel in the same size for $15.60 per 1,000 ft. stocks generally are good.

Tape.—This material is moving in proportion to the demand for other wiring supplies. Both friction and rubber tape were quoted at 36 cents per pound in 100-lb. lots.

Heating Appliances.—Household devices are showing more activity than at any time heretofore. Hollow ware, grills and toasters are moving fairly well on account of holiday orders.

Loom.—The demand is dull and stocks are small. In 1,000-ft. lots both the 7/32-in. and the ¼-in. sizes were quoted at $18 per 1,000 ft.

CHICAGO

Electrical trade has not changed materially this week. Wiring materials are still moving well and the majority of jobbers have not raised their prices because they prefer to wait until their present stocks are sold. Lamp sales, particularly in the smaller sizes, are reported going strong. Sales on radio receiving sets are increasing because a new station in Chicago is broadcasting grand opera. Schedule material is progressing steadily and prices are stable. While a few jobbers are not very optimistic as to trade for the remainder of the year, the majority of them feel that business will be good to those who go out and get it.

Flexible Armored Conductor.—Activity on this material is reported good, but the price on No. 14 two-wire double-strip still varies from $46 to $48 per 1,000 ft. in 5,000-ft. lots. Stocks are ample.

Conduit.—Movement on black conduit has been steady with the ½-in. black pipe selling between $46.50 and $48 per 1,000 ft. in 5,000-ft. lots. Jobbers report their stocks sufficient for present trade.

High-Tension Equipment.—An increased number of inquiries on 13,200-volt farm-line equipment was reported this week by one manufacturer. Since the usual inquiry asks about 6,600-volt equipment, these inquiries seem to indicate that longer lines are contemplated. An order of 100 ejector cut-outs was sent to Detroit by another company.

Pliers.—Demand has been fair and stocks are ample. The 6-in. side-cutting Klein plier sells for $2.80 and the 8-in. for $3.75.

Schedule Material.—Jobbers report fairly good movement on this material. The key socket sells for $18.15, the keyless for $16.50, both in box lots of 100. Pull-chain sockets are selling at $33 per 100. Snap switches are quoted at $18.50 in lots of 100.

Fuses.—Demand for fuse plugs is holding steady and stocks are fair to good. In lots of 1,000 or more they sell for $28 per 1,000. The non-renewable cartridges, 3-amp. to 30-amp., sell for $9.60 per 100 in standard packages.

Lamps.—Dealers state that the small-size lamps, from 25 watts to 75 watts, are moving well. Gas-filled lamps are also becoming popular. Some sales on 200-watt lamps for industrial purposes are reported.

Fixtures.—Dealers state that while there is a good movement on small fixtures for residences, the best activity is on industrial or office fixtures.

Radio Equipment.—The impetus created by broadcasting grand opera has increased the sale of this equipment. Jobbers report good sales on complete receiving sets ranging from $25 to $40.

Wire.—Although the copper market has strengthened slightly, many jobbers have not increased their prices on either weatherproof rubber-covered or bare wire. Sales on rubber-covered No. 14 at $6.60 per 1,000 ft., in 5,000-ft. lots, are progressing well. Weatherproof wire is moving fairly at 16½ cents a pound in 1,000-lb. lots. The bare wire base is still at 16½ cents.

BOSTON

Trade continues in fair volume without there having been much brisk buying in the past week. Despite the holiday interruptions the trend of sales is toward more active ordering. Small-order business still dominates the market. Appliance sales are beginning to respond to the holiday appeal, but stocks are thus far ample. Prices remained fairly steady last week except under very sharp competition. Weatherproof wire is a little stiffer on current quotations. Building operations outside Boston are proceeding toward better conditions, but within the city proper new projects are slow to materialize. Central-station outputs are improving, some companies showing decided gains over last year, ranging from 3 to 15 per cent. Jobbers' stocks are being kept relatively low, but no shortages of material were reported Monday. General business in New England is spotty, with continued healthy sales of textile products, fairly good leather sales and slightly improving metal-product movements. Collections are somewhat better than last month. A heavy consumption of overhead-line material began Monday among eastern New England utilities, which were hard hit by a sleet storm starting Sunday, preliminary estimates of the losses exceeding half a million dollars.

Motors.—Gradual improvement in motor demand is apparent. Current orders are being met partly from stock and in part from factory production. Prices show little change, and small units are in chief demand.

Lamps.—Better movement in both portables and fixtures is reported. Stocks are in fine shape for a good holiday trade. An exceptionally satisfactory sale of lamps has been a feature of this fall's business, considering other branches of the trade.

Loom.—Steady sales without spectacular-sized orders are noted. The ⅜-in. size moves around $16.50 per 1,000 ft. in 5,000-ft. lots and the ¼-in. size around $19. The feeling that prices are unsatisfactorily low continues to be manifested in jobbing circles.

Flexible Armored Conductor.—Building construction continues to absorb fair quantities of this material. Stocks are easily meeting requirements. No. 14 single-strip was selling Monday at $48 to $50 per 1,000 ft. in 5,000-ft. lots and at $49 to $51 where double-strip is specified.

Lamp Cord.—Easy conditions prevail as to supply. A moderate demand is under way, with No. 18 cotton-covered cord selling at $14.50 per 1,000 ft. in 1,000-ft. lots, prices being open on 5,000-ft. shipments.

Rigid Conduit.—Relatively quiet demand characterizes this week's trade. On ¾-in. black pipe, in less than 5,000-ft. lots, $67.91 is asked, and on galvanized pipe, in the same size and quantity, $73.36 per 1,000 ft.

Appliances.—Hollow ware for socket and table use is moving better, and in some quarters washing machines show quicker sales. The lighter class of heating devices is being sought for the holiday trade. Further improvement is expected daily.

Wire.—Rubber-covered wire is moving well at $6.25 per 1,000 ft. in 5,000-ft. lots. Weatherproof base has advanced ½ cent per pound to 16 cents. Storm damage is expected to increase the demand for the latter soon on various eastern Massachusetts properties, but on Monday of this week repairs were being made chiefly out of central-station stocks.

ATLANTA

The bond issue of $8,850,000 recently voted by the city of Atlanta has just been validated by the Supreme Court, and the Bond Commission announces that approximately $3,500,000 will be expended during the year of 1922. Of the total issue, $4,000,000 is for schools, $2,850,000 for waterworks, $750,000 for the construction of the Spring Street viaduct, and the remainder devoted to sewers. The construction of schools, additions to pumping equipment and construction of the Spring Street viaduct will be the first activities to get under way, with a consequent lessening of the unemployed in the city. The electrical jobbing business is somewhat sluggish as a result of the Thanksgiving holiday coming on top of the approaching inventory season. Most jobbers are making their purchases for immediate demands only, while the contractors are placing orders in smaller sizes than is the rule throughout the year. Owing to the continued warm weather, holiday purchases have not become generally in evidence.

Industrial conditions in the state at large continue to display a firmer tone, recent reports of the textile mills showing that 88 per cent of the mills are running full or overtime, 10 per cent one-half time and that 2 per cent are idle. Most of the mills in operation state they have orders on hand sufficient to take the output of the next sixty days.

Exhaust Fans.—The movement of this specialty has been somewhat disappointing throughout the year, and there is little pick-up in sight. Therefore local stocks have been allowed to become somewhat spotty, though factory shipments are good.

Portable Drills.—A continued steady, but not heavy, demand is to be noted in this line, the automobile trade causing a slight stimulation in sales. No recent change in price has been reported.

Christmas Tree Outfits.—Contrary to the usual schedule, little or no activity is evidenced in this line. Jobbers report a very small volume of orders from retailers, this being due to overstocking by retailers last fall.

Farm-Lighting Outfits.—This business continues to brighten, jobbers reporting increased sales and interest, particularly in Mississippi and Georgia. Sales in Alabama and Florida, however, are rather slow. Local stocks are in good shape.

Rigid Conduit.—A continued steady movement in this line is reported, though the volume still remains somewhat small. All sizes are on hand in sufficient quantities, with the exception that some jobbers report shortages in 3½-in. and 4-in. black and galvanized. No recent change in price is reported.

Safety Switches.—The sales in this line continue to increase because of the adoption of ordinances in the smaller towns requiring the installation of safety devices. The 30-amp. two-wire switch is still the most popular. Some of the jobbers report that recent heavy demands have reduced their stocks to a spotty condition.

Dry Batteries.—Sales in this line are on the increase, the demand being from the territory generally. Stocks are in good shape with quotations on barrel lots at 31 cents each.

Flashlights.—The fall season has caused a slight increase in the movement of this line, while the sale of batteries and lamps continue to hold up satisfactorily. Jobbers report ample stocks.

Wire.—A price advance of 50 cents per 100 lb. in both weatherproof and bare wire is reported today, with reasonably good orders being received for sizes No. 6 to No. 8 inclusive. Rubber-covered, with the exception of No. 12 and No. 14, is somewhat slow. Both varieties are on hand in ample quantities.

ST. LOUIS

The holiday of last week interfered with buying from jobbers, and the week's volume of trade was consequently under the recent averages. Virtually all of the initial requirements of holiday goods have been ordered, but there remain straggling orders for small amounts. There is a possibility of further orders if the public buys as anticipated, for dealers have bought very conservatively.

The industries show little improvement in their demand for electrical goods, but they are operating on a better basis, and a call for electrical goods should normally follow. Several of the steel mills are on full schedule, with reasonable back orders. The railroads are not buying extensively as yet, but are making healthy inquiries, presumably in preparation of their budgets for next year.

In construction work some improvement in the underlying elements is indicated. It appears that reductions in labor, material and financing costs may be effected, in which event a large volume of work will immediately follow. That promised to date, if the reductions are of sufficient mag-

nitude, amounts to $15,270,000. While no job in the list is for less than $200,000, they are not of particular concern to the electrical industry, for they consist of schools, hospitals, bank buildings, etc. No industrial work is included, but it would surely follow in goodly amounts if the construction costs should be materially lowered.

Air Heaters.—The demand has slackened because of the comparatively mild weather. Dealers' stocks generally are in line, but those of some jobbers are heavy. All buying is extremely conservative.

Table Appliances.—The demand for waffle irons continues good and stocks are still low. Percolators and toasters have been reasonably well stocked by dealers and their demand is consequently decreasing. The public interest in all table appliances this year is very encouraging.

Washing Machines.—Indications are that continued improvement in demand may be expected. Sales are better in southern Missouri and Arkansas and are holding up well in the northern portion of this territory. Stocks as a rule are in line with present requirements.

Ranges.—The sales in this territory are exceptionally quiet, but there are some indications of improvement in Missouri and Kansas. Very little business is being done in St. Louis, though no discouragement of range installations is being made there as in other places in the territory where power facilities are limited.

Flatirons.—Sales are extremely good, in the opinion of some, better than normal for this time of year. The lower prices this year have unquestionably stimulated purchasing. There are reasonable stocks.

Dishwashers.—A buyer is occasionally found, but the decrease in prices some time ago did not create much interest. It is felt that still lower prices and considerable educational work will be required before these can be made to move in satisfactory volume.

Wire.—An increase of ½ cent per pound has been made in the base prices of bare and weatherproof, the resulting prices being 15 cents and 15½ cents respectively. Rubber-covered prices are unchanged, No. 14 selling for $6.50 per 1,000 ft. in 5,000-ft. lots and for $6.40 per 1,000 ft. in 10,000-ft. lots. The demand for all wire the past week was dull. Residential jobs are being completed, and there is only a small amount of industrial and commercial work. Stocks are about in line, with a tendency to be heavy in the larger sizes.

PORTLAND—SEATTLE

Stormy weather prevailed throughout the Northwest generally during the past week, and Portland experienced a very unusual and severe sleet storm which completely demoralized public utility service in the district covered by the storm. Street-car service was paralyzed, and the two steam lines coming down the Columbia Gorge had at one time as many as eight or ten trains bound by snow and sleet. One power company lost fourteen continuous miles of transmission line, and the telephone company had more than twenty miles of poles and wire down on its toll lead in the gorge. The storm caused an unprecedented demand for linemen and line materials of all kinds. Portland stocks of insulators and line tools were immediately depleted and other Coast cities had to be drawn upon. Some high-tension insulators are coming from the East by express. Damage to the public utilities, exclusive of the steam roads, will amount to approximately $500,000.

Business in general in both Portland and Seattle continues to improve slightly and shows some gains over the marked improvement in September and October. The employment situation shows some improvement, lumber business is good, building continues, exports are heavy, and the situation is very satisfactory on the eve of the holiday season. In the city election in Portland the 1925 tax levy carried by a large majority, and this has been the cause of announcements concerning several large buildings.

Reports from electrical jobbers indicate that the electrical business, in common with others generally, is well sustained. Portland jobbers report a large demand for weatherproof wire, particularly Nos. 2, 4 and 6, as well as for poles, cross-arms, pins, insulators, pole-line hardware, duplex telephone wire and galvanized-iron wire.

Hollow Ware.—Jobbers have accumulated heavy stocks in anticipation of the Christmas trade. The carry-over from a year ago is small. A volume of business something in excess of that of last year is predicted.

SAN FRANCISCO

Welcome rainfall has given the ground a needed soaking. This came in the nick of time according to the farmers. Business is remaining fairly steady, but a better holiday season is predicted than last year.

Lamps.—Attention is drawn to an error in last week's issue in the statement that Edison, National and Westinghouse lamps were to be assembled and stored in the Oakland Lamp Works. The inclusion of Westinghouse lamps in this statement was of course a mistake.

Fixtures.—Remarkably keen competition is reported on all new fixture jobs, down to the smallest dwellings.

Electrical Appliances.—Holiday orders have been placed by most dealers, but buying is lighter than last season, not only because of larger stocks left over but because of a general expectation of a sharp drop after the first of the year. Waffle irons are selling very well. Another specialty which has become standard with most local dealers is a 1½-lb. electric iron.

Vacuum Cleaners.—A slight increase in sales is reported by a few manufacturers, although it is felt that the action of some makers in offering a free set of tools with each machine will produce bad effects for the future. The market is still steady, averaging about $50 to $60 per machine. Most of the sales teams have been withdrawn.

Ironers.—Business is holding up fairly well, although the washer business is poorer than it has been all year.

SALT LAKE CITY—DENVER

Jobbers of the Intermountain territory are considerably agitated over the proposed reduction of freight rates from the East to the Pacific Coast, without corresponding reductions to interior points. If the Interstate Commerce Commission cannot be prevailed on to make concessions to the Mountain States, it is believed the jobbing territory commanded by Salt Lake City and Denver will be materially reduced and business in general seriously damaged. Strong and concerted protest is being made against the pending action. The concern uppermost in every mind just at present is taxes. Forecasts indicate that all records for delinquency will be broken, since the rates are high and money is scarce. It is believed, too, that this universal obligation is going to cut in on the Christmas trade as never before. However, there are healthy signs of holiday buying. Electrical merchants are stocking fairly well with such items as are usually in demand at this season.

With the advent of a spell of cooler weather business generally has shown a healthy increase. Building of cottages continues unabated, with builders' hardware and electrical equipment in good demand. Road construction is proceeding vigorously in many counties, employing hundreds of men formerly out of work. With the completion of crop harvesting the demand for agricultural labor has fallen to a low mark.

Collections show little improvement from week to week. That there is considerable money for investment is indicated in the healthy tone of the bond market. Unusual rates of interest, however, ar edemanded as a prerequisite condition.

Air Heaters.—The general trade has been disappointing. Sales featuring price concessions have secured a few orders. A fall phenomenal for high temperature is the cause of inactivity.

Vacuum Cleaners.—No item of electrical merchandise is being more consistently and steadily pushed by jobbers and dealers alike. Demonstrations and educational work generally are keeping up a lively trade. Stocks are good in most of the standard makes. There have been no recent price changes.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

G. E. Plans Substitutes for Navy Electric Work

A statement from the Schenectady plant of the General Electric Company announces plans for increased employment to be offered part of the employees of the plant there to take the place of the prospective discontinuance of naval building. The company intends to build a substantial quantity of large apparatus for stock and will also arrange for a considerable amount of repair and maintenance work to be done during the winter months. The statement does not mention the number of men involved or the value of the work to be undertaken.

Present conditions at the Schenectady plant are considered good under prevailing conditions. There has been no recent lay-off and the announced retrenchment program has been carried out in part only. Although the plant is working on several orders, including one for the Japanese government, electrical work for the American government has claimed a good part of the production. A number of men were laid off when that work was temporarily cancelled. When the company received release on the navy work about 500 men were put back to work. Complete cessation of the work would affect about 1,000 men, but it is hoped to take care of a large percentage of this number by the stock and repair work mentioned above.

During its existence the company has received orders for $100,000,000 worth of electric drive machinery for ships, the greater percentage of this within the last five years. Naval disarmament may cut off some lucrative business for the company, but it is felt that this loss will be more than counterbalanced by increased orders from mercantile shipping interests. The company has sold in the aggregate approximately 2,000,000 hp. in electric turbines for ship drive, together with all the auxiliary apparatus.

Ohio Vacuum Cleaner Company Sales Encouraging

Some interesting figures on vacuum cleaner sales for the three months of August, September and October are given in the November issue of the *Red Band*, the house organ of the Ohio Electric Company, Cleveland. The same article also details a number of reasons for business optimisim and reads in part as follows:

"Although sales fell off slightly during October, the three-month average for August, September and October is 53 per cent greater than the low month, and the October increase is 64 per cent. Sales for August were 20 per cent greater than for July and the September total showed an increase of 82 per cent. Inquiries increased 7 per cent. to 53 per cent greater than the July record, while the three-month average was boosted to 43 per cent increase. The August increase was 29 per cent and that for September 46 per cent.

"Every barometer points to steadily bettering conditions. Every big business man is growing more optimistic, more certain that business is coming back has 'turned the corner.' Business is just coming into its new season of blossom and fruit; the frost is out of the ground, hardships virtually over. There is no doubt about that. Yet how many fail to see the hopeful signs on every hand. The farmer's buying power and willingness to buy are undoubtedly on the increase. The wheels of production are whirling faster. Freight is moving in greater volume every month.

"Governor Harding says: 'Business will not again dip as low—nor will it go as high—as it went before. The crisis has passed without most people knowing when. We need not look to heaven for a sign that conditions have improved. Actual prosperity was never as great as it seemed. Actual depression was never as low as it seemed. The present is the time for the constructive, hard-working optimist.'

"The public has great buying power. And buying power begets buying power. When one industry resumes others automatically revive, and industries are reviving."

Burroughs Machinery Corporation Acquires Burroughs Company

The Burroughs Composition Machinery Corporation, 246 North Tenth Street, Newark, N. J., has taken over the business of the Charles Burroughs Company, which for many years manufactured hydraulic and general machinery at 141-149 Commerce Street. The company was known to the electrical industry as a manufacturer of machinery for molding various types of insulators. A short while ago the Commerce Street property was disposed of to the city, and operations will be carried on in the future at the North Tenth Street plant. Charles Burroughs is president of the new organization.

Central Credit Men Discuss Reconstruction Problems at Chicago Meeting

Co-operation Between Credit and Sales Departments and More Intimate Contact with Banks Urged—Figures Show Large Increase in Claims Over Last Year

Closer co-operation between credit men and salesmen was advocated by W. E. Sargent, credit manager Cutler-Hammer Manufacturing Company, in a paper presented before the twenty-sixth annual meeting of the Electrical Credit Association at Chicago, Nov. 17 and 18. Mr. Sargent stated that if salesmen could be taught a few credit fundamentals these two departments would work in closer unison for better business. He also suggested a personal acquaintance between credit managers and business or manufacturing men.

With a set of charts George A. Hughes, president Edison Electric Appliance Company, Chicago, showed very clearly the past trend of business conditions. Since 1812 labor, wholesale and retail prices have risen for thirty years and then declined for twenty. Mr. Hughes declared that, considering the price peak of 1920 and the 1921 reductions, he felt business had turned the corner; but he advocated short-term bonds and ample but small stocks in order to take advantage of the return of the decline cycle. E. W. Shepard, general credit manager Western Electric Company, New York, in considering credits and reconstruction, advised a closer knowledge of business methods in the sales and accounting departments and also more intimate contact with the banks.

With fourteen million homes unwired in the United States, Stanley A. Dennis, associate editor of *Electrical Merchandising*, presented a realistic picture of the electrical credit men's job for 1922. He said that it was up to the credit men to find out whether a dealer was a good dealer or whether he would make a better contractor; it was a case of putting the right man in the right place. With this accomplished, the next thing to do would be the sale of electrical appliances and central-station service. However, the entire project requires an extensive educational campaign, and Mr. Dennis suggested that every credit man get behind these movements.

Other topics of interest were treated in addresses on "Value of Electrical Credit Service," by T. C. Russell, president Russell Electric Company, Chicago; "Creative Credit Management," by C. E. Vandel, Western Electric Company, Kansas City; "Hard Nuts to Crack," by A. V. Willet, Western Electric Company, Chicago; "The Viewpoint," by M. W. Scanlon, Westinghouse Electric & Manufacturing Company, East Pittsburgh, and "Sample Credit and Collection Forms," by H. H. Pribbanow, Julius Andrae & Sons Company, Milwaukee.

B. P. George was re-elected to the president's chair and to the national board. J. H. Taylor was elected to the vice-presidency and also to the executive committee. Elmer Forsell is the other new member on the executive committee.

An insight into the past year's credit conditions was afforded by the figures on claims reported and adjusted during the year as submitted to the meeting. The total number of claims reported to Nov. 1 was 104,727, involving $9,656,701, an increase of 43 per cent in number and 41 per cent in amount over last year. The total number of claims adjusted during the same period was 61,823, involving $5,441,426. This constituted an increase of 59 per cent in number and 69 per cent in amount.

Equity Receivership for Habirshaw

On the application of the Habirshaw Electric Cable Company John B. Johnston and John S. Worley have been appointed by Judge Knox in the federal court as receivers in equity of the Habirshaw Electric Cable Company, Inc., the Electric Cable Company and the Bare Wire Company. The plaintiff brought the equity receivership suit as a creditor and stockholder of the three companies. The petition stated that the defendant companies are under joint management and have debts aggregating about $5,000,000. Their assets are estimated at about $7,000,000.

Those companies, despite their assets, are said to be financially embarrassed at the present time and unable to pay pending and maturing claims. The claims of the Habirshaw Electric Cable Company amount to $430,000 for money loaned. The Habirshaw Electric Cable Company, Inc., has a capital stock of $925,000. Its plant is at Yonkers. The Electric Cable Company has a capital stock of $1,500,000 and is located at Bridgeport, Conn. The plant of the Bare Wire Company is in New York City. The company is capitalized at $500,000.

According to the papers filed the Habirshaw Electric Cable Company, Inc., owes about $1,025,000 to banks and trust companies, $1,000,000 to merchandise creditors and $680,000 to the United States government, the balance of a note for $1,247,000 accepted by the Secretary of War in 1919. Liabilities of the Electric Cable Company are debts to banks and trust companies, amounting to $525,000; merchandise, $300,000, and $334,000 on a note given to the Secretary of War in 1918. It was said that under a trust agreement there is also a joint liability of $1,997,000 in debenture bonds issued under a trust agreement with the Guaranty Trust Company. In connection with that transaction the plaintiff is understood to be liable to some extent. The Bare Wire Company is said to owe $490,644 for loans and $34,500 for merchandise.

With the filing of the papers in the receivership suit the counsel for the defendant corporations put in answers, admitting the allegations of the plaintiff.

John S. Worley, one of the receivers, stated to a representative of the ELECTRICAL WORLD that the reorganization may be regarded as a step forward in the affairs of the company and a necessary move toward reorganization. All the defendant's plants will be kept in production as before, as business is showing improvement. The Bridgeport plant of the Electric Cable Company at the present time is running with a double shift and is close to capacity.

Corporation Formed to Promote Foreign Trade

Five non-competing companies have announced their joint interest in the Associated Machinery Corporation, a newly organized company, formed for the purpose of promoting the foreign trade of the constituent companies. They are the Blaw-Knox Company of Pittsburgh, the Novo Engine Company of Lansing, Mich., the Pawling & Harnischfeger Company of Milwaukee, the Chain Belt Company of Milwaukee and the Insley Manufacturing Company of Indianapolis. All these concerns have a growing trade in Burmah and other parts of India and in Ceylon, and by the co-ordination of sales effort they expect to enlarge it and at the same time be in a position to render more service to their customers. The officers of the new company are: Henry Harnischfeger, president; Clarence E. Bement, vice-president, and Clifford E. Messenger, secretary and treasurer. Lionel R. Vinall-Moon is the managing director in India, and Charles L. Langlotz is in charge of the New York office.

Insulating Oil-Testing Service Started

An oil-testing service has been established by the Westinghouse Electric & Manufacturing Company whereby operators can mail samples of insulating oil to the Westinghouse works for test. A thoroughly dry bottle and a safe mailing container are provided, according to the announcement, and receipt at the works is followed by careful testing and a prompt report of test result. This fills the needs of many power-plant operators who have no good method of telling whether or not their transformer oil is in perfect condition.

Considerable thought has been given to the development of this service, it is stated, with the idea of making it simple for the operator to handle and giving him a prompt report as to the condition of the oil. After drawing the sample, the operators seals, packs and mails the bottle to the engineering laboratory of the Westinghouse Company at East Pittsburgh. An instruction and order sheet and a printed return label are provided, the instructions covering the taking of the sample and its proper separation for mailing. In case that the tests show the oil not to be in first-class condition, the proper treatment is suggested.

Torrington Doubles Sales of Last October

October shipments of the Torrington electric vacuum cleaner, it is reported by the Torrington Company, exceeded the shipments of October, 1920, by more than 200 per cent. The company has extended the time limit on its special offer of a set of attachments free with each cleaner sold from Nov. 30 to Dec. 31. This nation-wide drive to popularize the attachments should result in increase in future sales.

National X-Ray Prepares Package Showcase Outfits

In order to stimulate sales on showcase lighting fixtures, the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, has announced its policy of furnishing "X-Ray Scoopetes" in package outfits so that jobbers and dealers can make immediate shipments direct from their stocks. Since there are two standard types and length of showcases, these package outfits are supplied for standard square wood-frame or all-glass cases in 6-ft. and 8-ft. lengths. Each package contains in addition all the necessary material, etc., to equip the case completely, except lamps. A system of cover marking shows the number of lights contained and also the wood-frame case length.

St. Louis Brass to Make Own Glassware

The St. Louis Brass Manufacturing Company has announced plans for the erection of a glass factory in St. Louis where all the glassware for its lighting fixtures will be made. All of its glassware is now being purchased. The factory will be modern in every respect and will be equipped for making white, crystal and opal glass. Construction work will not be started until building costs are lower and in any event not until next spring.

Very attractive business has obtained during 1921, according to E. F. Guth, president of the company, who states that the number of "Brascolite" and "Aglite" lighting units sold will considerably exceed that in any preceding year excepting 1920 and will amount to about 60 per cent of the number sold in that year. The present plant is operating now with virtually a full force. Business in the brass department has been extremely good, and the total volume for all departments will compare quite favorably with even the 1920 business. The demand this year from office buildings has been dull, but good trade has been found in fixtures for clubs, lodges, churches, hospitals and hotels. There is a strong demand at the present time for fixtures for new hospitals.

Midwest Steel Secures Rights on Air Filter

EXCLUSIVE manufacturing and sales rights for the North American Continent on an air filter for generators and other machinery have been secured by the Midwest Steel & Supply Company, 28 West Forty-fourth Street, New York. The original patents are owned by European interests, and there are at present more than 1,500 installations in industrial plants and central stations in Europe. The filters are furnished in interchangeable units. The Midwest company will produce them at its plant in Bradford, Pa.

L. J. Land announces the dissolution of the firm of Schwartz & Land, 207 Center Street, New York City, dealer in electrical machinery, power plant equipment, etc., and that he will continue the above business under the name of L. J. Land at the same location.

The Packard Electric Company, Warren, Ohio, announces that O. T. Hall, 1926 Edmondson Avenue, Baltimore, has been appointed as its exclusive agent in Maryland, Virginia and the District of Columbia, with right of sales to all parties but the United States government.

Square D Opens Sales Office in St. Louis.—A district sales office has been opened by the Square D Company, Detroit, manufacturers of inclosed switches, at 312 International Life Building, St. Louis. J. D. Utley has been appointed office manager, while W. S. Herman is district sales manager.

The Lamp Salvage Corporation of America, 501 West 145th Street, New York City, recently organized to manufacture electric lamps, etc., has filed notice of change in name to the Phoenix Lamp Corporation.

The Riter-Conley Company, Oliver Building, Pittsburgh, Pa., announces that it has opened an office in the Scollard Building, Dallas, Tex.

Foreign Trade Notes

WATER POWER IN PORTUGAL.—There are many schemes under consideration, according to the *Electrician*, for utilizing water power in Portugal, the largest of which is that on the Douro River, where it is estimated 350,000 hp. can be developed. Before this can be carried out arrangements will have to be made with Spain, as the river where it will be diverted into a canal flows between the two frontiers. The total horsepower available is placed at more than 600,000. One of the difficulties in all water-power schemes in Portugal is that the flow of waters in the rivers is very low in summer, owing to prolonged drought, while in winter there are apt to be floods.

PROPOSED SCHEME TO SUPPLY ELECTRICITY FOR NORTHWEST COAST OF TASMANIA.—In connection with the scheme to supply electricity to the towns on the northwest coast of Tasmania, according to the *Industrial Australian and Mining Standard*, it is proposed to secure power from the vicinity of Cradle Mountain. In order to obtain a cheap rate it would be necessary to enter into an arrangement for a stated quantity. Devonport has agreed to take 2,000 hp.; Ulverstone, it is suggested, should be able to absorb 500 hp., Burnie 1,000 hp., and Wynard 300 hp. The cost of connecting the coast with the government scheme is estimated by Mr. Butters, chief engineer of the government Hydro-Electric Department, at £250,000. He proposes to bring electricity down to Penguin and step it down for distribution at that center.

ELECTRIC RAILWAYS FOR INDIA.—The B. B. and C. I. Railway administration in India, according to *Electrical Industries*, has been authorized to equip its suburban service for electrical operation.

GROWING DEMAND FOR ELECTRICAL SUPPLIES IN SOUTH AFRICA.—According to the Commerce Reports, there is a growing activity in the electrical trade in South Africa, owing to the settlement of the building trade strike, combined with a gradual decline of wiring supplies as dealers liquidated their higher-priced stocks. Technical journals report that consignments of electrical goods continue to arrive steadily from Great Britain and more slowly from the continent, and the United States. Shipments from England, it is stated, are as a rule taking about three weeks, whereas goods from Germany arrived seven or eight weeks after the date of drawing upon the merchants. In the case of American goods five or six weeks is the more or less normal time of delivery, counting from the date of drawing upon the South African buyer.

SHORTAGE OF TELEPHONE INSTRUMENTS AND MATERIALS IN AUSTRALIA.—The capital cities of Australia, according to reports from Commissioner A. W. Ferrin to the Department of Commerce, are experiencing a severe shortage of telephones. In Sydney alone about Aug. 1 more than 4,000 instruments were lacking, and a later shipment of 1,000 relieved the situation to only a limited extent as a scarcity of other materials prevented the installation of most of the telephones. Six switchboards ordered in August, 1920, were still undelivered in August, 1921, and of the 60,000 telephones ordered at the same time only 9,000 have been received, while of the 138,000 instruments ordered since August, 1920, only about 3,000 had arrived in Australia a year later. Material valued at £1,000,000, it is stated, is outstanding.

NEW TELEGRAPH LINE IN BRAZIL.—The Brazilian Minister of Public Works on Oct. 4, 1921, according to the *Diario Official* of that date, was allotted a credit of 80,000 milreis for the construction of a telegraph line from the Iguacu Falls, Catandubas, Brazil, to Porto Mendes.

THE ONWARD MANUFACTURING COMPANY, Kitchener, Ont., announces that it has established a retail branch store at 40 Notre Dame Avenue, Winnipeg, under the name of the Eureka Vacuum Cleaner Company, for the sale of the "Eureka" vacuum cleaner and the "Sunnysuds" washer.

THE ALLGEMEINE ELEKTRICITAETS GESELLSCHAFT, of Germany, has increased its dividend from 14 per cent to 76 per cent after setting aside 100,000,000 marks for maintaining plant repairs. Within the next year, it is said, the board of directors proposes to issue 250,000,000 marks in new common stock.

RESTRICTIONS REMOVED ON IMPORTS FROM UNITED STATES INTO ITALY.—A cablegram from Commercial Attaché H. C. McLean at Rome, Italy, to the Department of Commerce states that the removal of restrictions on the importation of American products has been made by agreement between the United States and Italy. The only products which cannot be imported without a license are certain synthetic dyes and those articles the importation of which is reserved to the government, namely, sugar, tobacco, saccharine, matches, playing cards, oats, meats, salted and frozen and in tin, and bacon.

HYDRO-ELECTRIC PLANT FOR THEREZOPOLIS, BRAZIL.—Plans are under way for the installation of an electric lighting and power system at Therezopolis, a summer resort within easy reach of Rio de Janeiro, according to Assistant Trade Commissioner W. E. Embrye. Water rights have already been obtained on a nearby estate where a large hydro-electric plant will be erected.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

A mercantile firm in France (No. 350) desires to purchase all kinds of electrical appliances for household uses, particularly carpet sweepers and brushes for polishing hardwood floors.

A firm in Canada (No. 351) desires to purchase portable electric lamps.

ELECTRIC EQUIPMENT FOR POWER PLANT AT NEWCASTLE, AUSTRALIA.—Tenders will be received by the Government Railways and Tramways Department, Philip Street, Sydney, New South Wales, Australia, until Feb. 22, 1922, according to the *Electrician*, for furnishing and erecting one 5,000-kw., 50-cycle turbo-alternator, with condenser and accessories, at the Zarra Street power house, Newcastle.

INSULATED CABLE FOR ELECTRIC SYSTEM AT BRISBANE, AUSTRALIA.—The City Electric Company, Brisbane, Australia, according to the *Electrician* will receive tenders until Feb. 10, 1922, for 6 miles of 0.15-in. paper-insulated cable, suitable for 5,500 volts, with a non-earth system.

TELEPHONE EQUIPMENT FOR CITY OF ADELAIDE, AUSTRALIA.—Tenders will be received by the Deputy Postmaster General, Adelaide, Australia, until Jan. 4, 1922, according to the *Electrician*, for telephone apparatus and material, including cords, hand sets, supervisory lamps, plugs, jacks, etc.

New Apparatus and Publications

RESTAURANT KITCHEN UNIT. — A motor-driven unit designed to take over all the mixing, beating, whipping and straining operations in the hotel or restaurant kitchen, known as "Kitchen King" has been developed by the Hall Kitchen King Company, 1130 Race Street, Philadelphia.

CREAM SEPARATORS.—Two new motor-driven cream separators of the link-blade type have recently been placed on the market by D. M. Burrell & Company, Inc., Little Falls, N. Y.

ELECTRIC WATER HEATER.—An improved model of the circulation "Sepco" automatic electric water heater has been placed on the market by the Automatic Electric Heater Company, Warren, Pa.

TIMING AND SIGNALLING INSTRUMENTS.—The Stromberg Electric Company, 209 West Jackson Boulevard, Chicago, is distributing bulletin No. 214 describing its "Process" timing and signalling instruments recently placed on the market.

ELECTRIC HOIST—The Shepard Electric Crane & Hoist Company, Montour Falls, is distributing a leaflet describing its "Lift-about," a small general utility hoist.

MOTORS AND GENERATORS. — The Peerless Electric Company, Warren, Ohio, is distributing bulletin No. 37-A, covering its direct-current "Multipolar" motors and generators.

AMPERE METER.—The Sangamo Electric Company, Springfield, Ill., is distributing bulletin No. 58 (superseding bulletin No. 50), describing its locomotive type ampere-hour meter.

GENERATORS AND MOTORS. — The Eck Dynamo & Motor Company, Belleville, N. J., has issued bulletins Nos. 1,300, 1,500, 1,600, 1,900, describing its direct-current motors, vertical motors, back-geared motors and polyphase induction motors respectively, and No. 2,201, covering its type "CB" organ generator.

GENERATOR UNITS.—"Steam Turbine and Generator Units" is the title of bulletin No. 1,119, issued by the Allis-Chalmers Manufacturing Company, Milwaukee, covering its high-pressure condensing steam turbine and generator units for public utilities, municipal railways and lighting and all industrial activities.

WATER HEATERS. — The new sales manual recently issued by the Automatic Electric Heater Company Warren, Pa., contains numerous tables regarding the quantity of water required for home use, the proper temperature, etc.

ELECTRICAL INSTRUMENTS. — The Jewell Electrical Instrument Company, 1,640-50 Walnut Street, Chicago, is distributing a pocket memorandum book, entitled the "Jot Book," in which it describes several of its electrical instruments.

MULTIPLE ILLUMINATION.—Bulletin No. 110, issued by the Kuhlman Electric Company, Bay City, Mich., describes its different types of transformers for street-lighting purposes.

RENEWABLE FUSE.—The Cote Brothers Manufacturing Corporation, 1,546 Tribune Building, Chicago, has recently brought out a new renewable fuse. It is of the Edison type and for use on circuits of 125 volts with ratings from 3 amp. to 30 amp.

New Companies

THE BIPPUS UTILITY COMPANY, Huntington, Ind., has been organized with a capital stock of $100,000 by J. S. Bippus, Frank Martin, Harry Helm and J. A. Browne. The company proposes to operate an electric light, heat and power system.

THE BREWER AUTO ELECTRIC COMPANY, Vincennes, Ind., has been incorporated with a capital stock of $25,000 to manufacture electrical equipment. The incorporators are H. L. Brewer, George W. Purcell and E. R. Purcell.

THE AMERICAN ELECTRIC EQUIPMENT COMPANY has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $2,000,000 to manufacture electric light fixtures and other electrical equipment. The local incorporators are M. L. Rogers, L. R. Wilson and W. G. Singer. The Delaware Registration Trust Company, Wilmington, Del., represents the company.

THE SNYDER TOWNSHIP LIGHT, HEAT & POWER COMPANY, Brockwayville, Pa., has been organized with a nominal capital stock of $5,000 to operate a local electric light and power system. M. E. Keys, Brockwayville, is treasurer.

THE TAYLOR-CAMPBELL ELECTRIC COMPANY, Ltd., London, Ont., has been incorporated by John M. Marshall, Earl L. Campbell, Albert T. Taylor and others. The company is capitalized at $250,000 and proposes to manufacture and deal in electrical machinery, equipment, dynamos, lighting plants, etc.

THE WESTERN IOWA POWER COMPANY, Peterson, Iowa, has been incorporated with a capital stock of $250,000. The officers are: D. McMillan, president; A. O. Anderson, vice-president, and A. W. Jones, secretary and treasurer.

THE VINCENNES (IND.) ELECTRIC RAILWAY COMPANY has been incorporated with a capital stock of $100,000 by G. H. Armstrong, J. H. Powers, E. C. Theohold, L. Gillett and E. R. Emison.

THE CONDUIT ELECTRIC SUPPLY CORPORATION, Syracuse, N. Y., has been incorporated with a capital stock of $30,000 by A. H. Poole and J. F. Troutman, to manufacture electrical equipment. The company is represented by Jacob G. Smith, First National Bank Building, Syracuse.

THE STANDARD ARMATURE WINDING MACHINE COMPANY, New York, N. Y., has been incorporated by M. W. Welling, P. F. Rhoades and F. B. Hand, 52 Wall Street. The company is capitalized at $10,000 and proposes to manufacture electrical machinery.

THE INCANDESCENT PRODUCTS, INC., Jersey City, N. J., has been incorporated by Nathan and Morris G. Fredman, 665 Newark Avenue, Jersey City. The company is capitalized at $25,000 and proposes to manufacture electric lamps and other electrical products.

Record of Electrical Patents

Notes on United States Patents

(Issued Nov. 1, 1921)

1,395,281. DRY-BATTERY CELL; Harry M. Koretzky, New York, N. Y. App. filed Sept. 18, 1919. For portable flashlights.

1,395,282. DRY-BATTERY CELL; Harry M. Koretzky, New York, N. Y. App. filed Sept. 18, 1919. For portable flashlights.

1,395,290. NON-ARCING COMMUTATING SWITCH DEVICE; Louis Paulero, Petersburg, Va. App. filed March 14, 1919. For use with electric hammers.

1,395,294. MEASURING INSTRUMENT; Raymond T. Pierce, Wilkinsburg, Pa. App. filed April 5, 1917. For indicating rate of change in speed.

1,395,304. ELECTROLYTIC CONDENSER; Joseph Slepian, Wilkinsburg, Pa. App. filed Dec. 30, 1919. Film-forming electrodes in suitable electrolyte.

1,395,305. ELECTROLYTIC CONDENSER; Joseph Slepian, Wilkinsburg, Pa. App. filed Dec. 30, 1919. Film-forming electrodes in suitable electrolyte.

1,395,306. METHOD AND APPARATUS FOR CALIBRATING MEASURING-INSTRUMENT TRANSFORMERS; Henry N. Stroh, Pittsburgh, Pa. App. filed Nov. 22, 1918. One portable box.

1,395,335. ELECTRICAL MEASURING INSTRUMENT; Lewis W. Chubb, Pittsburgh, Pa. App. filed Aug. 10, 1916. Determining penalty to be imposed against distorted voltage waves.

1,395,344. ARMATURE-EXCITED DYNAMO-ELECTRIC MACHINE; Rudolf E. Hellmund, Swissvale, Pa. App. filed Dec. 1, 1916. Alternating-current motors of commutator type.

1,395,345. UPRIGHT ELECTRIC TOASTER; Henry W. Jutton, Hamilton, Ont., Can. App. filed Oct. 2, 1920. Wire supporting frame and top rack.

1,395,347. VENTILATION OF DYNAMO-ELECTRIC MACHINES; Roy A. McCarty, Wilkinsburg, Pa. App. filed Sept. 28, 1917. For machines arranged side by side.

1,395,349. SYSTEM OF CONTROL; Paul L. Mardis, Wilkinsburg, Pa. App. filed Feb. 3, 1917. For railway vehicles.

1,395,378. SECRET SIGNALING; Richard H. Wilson, Newark, N. J. App. filed Sept. 29, 1919. High-frequency carrier waves for conveying voice waves.

1,395,390. OSCILLATION-GENERATING SYSTEM; Lewis M. Clement, Newark, N. J. App. filed Sept. 30, 1918. For signaling and other transmission systems.

1,395,409. WINDING FOR DYNAMO-ELECTRIC MACHINES; Floyd T. Hague, Pittsburgh, Pa. App. filed Sept. 15, 1916. Large capacity and high speed.

1,395,440. BRUSH HOLDER; Albert T. Lochner, Chicago, Ill. App. filed July 17, 1919. Few parts.

1,395,454. RADIO SIGNALING SYSTEM; James H. Rogers, Hyattsville, Md. App. filed Sept. 12, 1921. For use in submarine vessels.

1,395,493. SWITCH LOCK; Edward A Halbleib, Rochester, N. Y. App. filed May 17, 1917. For locking electric switch against unauthorized operation.

1,395,520. ALTERNATING-CURRENT RECTIFIER; Charles J. Quill, San Francisco, Cal. App. filed Aug. 21, 1917. Mechanical.

1,395,521. ALTERNATING-CURRENT RECTIFIER; Charles J. Quill, San Francisco, Cal. App. filed Jan. 31, 1917. Mechanical.

1,395,548. CIGAR LIGHTER FOR STEERING WHEELS; Edward H. Anshelm, Cambridge, Mass. App. filed Jan. 20, 1920.

1,395,579. RESISTANCE SWITCH; Charles B. Jones, Above Cynwyd, Pa. App. filed Jan. 16, 1920. For reducing illumination from light.

1,395,584. MULTIPLE-UNIT ELECTRIC HEATER; William A Kennedy, Leonia, N. J. App. filed May 26, 1920. Sends heat in all directions.

1,395,595. TELEPHONE SYSTEM; Lipa Polinkowsky, Antwerp, Belgium. App. filed Nov. 1, 1919. Machine switching.

1,395,599. ELECTRICAL ACTUATING MEANS FOR TYPEWRITER TYPE BARS AND OTHER DEVICES; Ferdinand Satterstrom, Hastings, Minn. App. filed Jan. 31, 1920. Single pair of platinum contact points.

1,395,600. ELECTRICAL ACTUATING MEANS FOR TYPEWRITER TYPE BARS AND OTHER DEVICES; Ferdinand Satterstrom, Hastings, Minn. App. filed Oct. 29, 1920. Series of selective magnets.

1,395,635. ELECTRIC IRON; Thomas D. Finzio, Kitchawan, N. Y. App. filed April 16, 1920. Few parts.

1,395,640. MOTOR ATTACHMENT FOR SEWING MACHINES; Martin Hemleb, Elizabeth, N. J. App. filed July 18, 1919. Motor and controller adapted for ready application to ordinary machine.

1,395,653. PRESSURE-MEASURING INSTRUMENT; Walther Nernst, Berlin, Germany. App. filed June 14, 1919. Measuring and recording quickly varying pressures.

1,395,683. STORAGE BATTERY; Swan J. Leveen, Rock Island, Ill. App. filed June 12, 1919. Warping of plate decreased.

1,395,685. MANUFACTURE OF ALKALI PERBORATES; Otto Liebknecht, Frankfort-on-the-Main, Germany. App. filed Jan. 27, 1917. Electrolytic manufacture from lyes containing soda and borax.

1,395,704. ELECTROLYTIC CELL; John Gerstle Dayton, Ohio. App. filed Dec. 6, 1920. Electrodes easily removed.

1,395,710. ELECTRIC LIGHTING FIXTURE; Max Herskovitz, Chicago, Ill. App. filed Oct. 18, 1918. Quickly assembled, wired and attached.

1,395,711. ELECTRIC LIGHTING FIXTURE; Max Herskovitz, Chicago, Ill. App. filed March 3, 1919. Readily assembled, wired and attached.

1,395,779. ELECTRIC REGULATOR; William A. Turbayne, Niagara Falls, N. Y. App. filed Oct. 10, 1919. Large range of regulation.

1,395,788. TERMINAL FOR WIRES OF ELECTRIC CIRCUIT; Stanley Anthony, Boston, Mass. App. filed Oct. 28, 1918. Terminal screw.

1,395,811. TREATMENT OF ZINC-BEARING ORES; Herbert W. Gepp, Melbourne, Victoria, Australia. App. filed Nov. 7, 1919. Zinc sulphide concentrates.

1,395,826. SUPERVISORY SIGNALING SYSTEM; Richard M. Hopkins, Rutherford, N. J. App. filed March 18, 1918. For fire-sprinkler system.

1,395,827. SEPARATING METALS BY ELECTROLYSIS; Noak V. Hybinette, Christiania, Norway. App. filed Feb. 16, 1920. Smelting ore into copper-nickel anodes.

1,395,847. ADJUSTABLE LAMP SUPPORT; William Lorey, Philadelphia, Pa. App. filed May 25, 1920. Arm adapted to be adjusted universally.

1,395,854. BALANCING SIGNALING SYSTEMS; William H. Martin, New York, N. Y. App. filed Dec. 19, 1918. Ocean-cable signaling.

1,395,864. EAR-APPLIANCE MOUNTING; Herman G. Pape, New York, N. Y. App. filed Aug. 24, 1918. Anti-acoustic appliance.

1,395,873. TROLLEY-WIRE CONTACTOR; Richard R. Scoggan, Jeffersonville, Ind. App. filed Jan. 7, 1921. Requires no deflection of trolley wire.

1,395,918. PACKAGE OF X-RAY FILMS; John G. Jones, Rochester, N. Y. App. filed Aug. 27, 1919. Films separately packed in light-proof packages.

1,395,931. ELECTRIC CONDENSER; Charles F. Smith and William H. Smith, Brooklyn, N. Y. App. filed May 17, 1920. For wireless telegraphy.

1,395,953. TELEGRAPHIC SYSTEM; Enrico Frattola, Vitale E. Castelli and Romualdo Regnoni, Rome, Italy. App. filed Jan. 5, 1919. For protecting instruments.

1,395,955. INCUBATOR; Herman Gentis, Victoria, B. C. App. filed Oct. 3, 1919. Electrically heated.

1,395,977. TELEPHONE-EXCHANGE SYSTEM; Franklin A. Stearn, Paterson, N. J. App. filed Aug. 7, 1920. Mechanical switching.

1,395,987. WIRELESS SIGNALING APPARATUS; Henry J. Round, London, England. App. filed March 24, 1921. Wave length of an aërial kept constant automatically.

(Issued Nov. 8, 1921)

1,396,030. VARIABLE CONDENSER; William Dubilier, New York, N. Y. App. filed July 25, 1917. Extreme flexibility of adjustment.

1,396,046. TOY THEATER; Edward S. Moore, Brooklyn, N. Y. App. filed Feb. 1, 1919. Images may be moved on the stage.

1,396,058. PROCESS FOR MAKING CARBIDE; James H. Reid, Pittsburgh, Pa. App. filed Sept. 21, 1917. Electric furnace.

1,396,095. SWITCH LOCK; George A. Cokely and Michael D. Crawford, Garrett, Pa.

1,396,101. ELECTRIC SYSTEM; Alfred J. Dreyer, Milwaukee, Wis. App. filed Aug. 12, 1920. Dynamic braking.

1,396,104. HEATER; Welborn C. Garner, Edmonton, Alberta, Can. App. filed Sept. 25, 1920. For cookers.

1,396,105. ELECTRICAL HEATING ELEMENT; Welborn C. Garner, Edmonton, Alberta, Can. App. filed Sept. 25, 1920. For heating or cooking.

1,396,112. SYSTEM FOR PROTECTING ELECTRIC-CURRENT-DISTRIBUTING NETS AGAINST TEMPORARY INTERRUPTIONS; Martin Hochstadter, Berlin, Germany. App. filed Oct. 20, 1914. Faulty branch immediately and automatically severed at both terminals.

1,396,121. ELECTRIC WATER HEATER; Richard S. Jacobsen, Chicago, Ill. App. filed Aug. 22, 1917. Attached to faucet.

1,396,155. ELECTRICAL TANK GAGE; Ernest C. Bartlett and Joseph E. Allison, Houston, Tex. App. filed Sept. 8, 1917. Amount of fluid shown.

1,396,172. STORAGE BATTERY; Ralph G. Fear, Oakland, Cal. App. filed Feb. 7, 1920. Means for automatically maintaining constant level of electrolyte.

1,396,178. SOUND-TRANSMITTING APPARATUS; Earl H. Foley, Seattle, Wash. App. filed Aug. 19, 1915. Sound wave recorded as a line of current-conducting material on paper strip.

1,396,222. OZONIZER; William G. Lindemann, Milwaukee, Wis. App. filed April 25, 1919. Elements readily repaired.

1,396,242. CONTROLLING SYSTEM FOR STORAGE BATTERIES; Clarence E. Beach, Binghamton, N. Y. App. filed Feb. 11, 1920. For combination night watch and fire alarm or burglar alarm.

1,396,309. ELECTRICAL SYSTEM; Clarence R. Young, Leesburg, Ind. App. filed March 1, 1918. For isolated installations.

1,396,318. ANTISTATIC FRICTION DEVICE; August Bunger, Hoboken, N. J. App. filed July 15, 1920. For extracting static-electricity from paper.

1,396,334. ELECTRIC MOTOR; Leslie R. McDonald, Montreal, Que., Can. App. filed June 16, 1916. Continuous rotation at low velocity.

Construction News

Projects, Plans, Bids and Contracts Contemplated or Under Way

New England States

AYER, MASS.—The Ayer Electric Light Company is considering connecting up with the line of the New England Power Company from Leominster to Nashua, which crosses Ayer. If the connection is made, the power company would establish a substation near the remount depot, stepping the electricity down to 13,000 volts, at which it would be taken by the light company for distribution at its local plant. L. Whitcomb is manager of the Ayer company.

CAMBRIDGE, MASS.—The Cambridge Electric Light Company has petitioned the Department of Public Utilities for permission to issue $450,000 in stock, the proceeds to be used for paying in part the floating indebtedness of the company, for the purchase of additional property, extension to its plant, etc.

CHELSEA, MASS.—The installation of an ornamental lighting system on portions of Broadway and Washington Avenue is under consideration.

Middle Atlantic States

BROOKLYN, N. Y. — Bids will be received by C. L. Cadle, superintendent of public works, Capitol, Albany, until Dec. 20, for the installation of electric wiring, power and battery-charging equipment in the canal terminal warehouse at Gowanus Bay, Brooklyn. (Terminal Contract No. 115.)

CANANDAIGUA, N. Y.—An agreement has been reached by the City Council and the Rochester Gas & Electric Corporation relative to the installation of an electric lighting system in the business section of Main Street. The contract provides for

about forty iron standards maintained by underground wires.

CLINTON, N. Y.—The Madison Power Company has been authorized by the Public Service Commission to construct an electric distrbuting system in Clinton and part of Kirkland township.

MORAVIA, N. Y.—The Moravia Electric Light, Heat & Power Company has been authorized by the Public Service Commission to make extensions to its electric lighting system in the towns of Moravia and Locke.

ATLANTIC CITY, N. J.—The Chamber of Commerce is co-operating with the Camden County Federation of Civic Associations in a movement started for the installation of an ornamental lighting system on White Horse Pike.

MONTCLAIR, N. J. — The Montclair Town Commission recently passed on first reading a new ordinance providing for improvement to the lighting system on Bloomfield Avenue, other business streets and railroad centers, and appropriating $45,000 for that purpose. James T. Hannan is director of the department of streets and public improvements.

LANSDALE, PA.—The installation of new power equipment in the municipal electric power plant is under consideration by the Borough Council.

MOSCOW, PA. — The Moscow Electric Company is negotiating with the Scranton Electric Company to obtain electricity for light and power in Moscow and other communities. Plans are under way for the erection of a transmission line. J. W. Knedler, Moscow, is president of the Moscow company.

PHILADELPHIA, PA.—The J. S. Ivins Sons, Inc., 627 North Broad Street, is planning extensions to its baking plant. Ovens, power plant equipment, conveyors, etc., will be required. Howard S. Roberts is president.

PITTSBURGH, PA.—Preliminary plans are under way by the Aluminum Company of America, Oliver Building, Pittsburgh, Pa., for a hydro-electric generating plant in the vicinity of Long Sault Rapids, N. Y. J. W. Rickey, Oliver Building, is engineer.

SCRANTON, PA.—Plans are under way by the Scranton Electric Company for extensions and improvements to its power plant and system, to cost about $1,000,000. The project includes an addition to the generating plant on North Washington Street and the installation of a 20,000 kw. turbo-generator with auxiliary machinery.

CLEVELAND, VA.—The Cleveland Light & Power Company, recently incorporated with a capital stock of $10,000, proposes to establish and operate a light and power system in Cleveland. S. C. Couch is president.

North Central States

ADRIAN, MICH.—The Citizens' Light & Power Company will install a 2,000-kw. turbo-generator with surface condenser and other necessary apparatus. It is planned to have the new equipment in use by Aug. 1, 1922. H. A. Fee is president.

CRYSTAL FALLS, MICH.—The Peninsular Power Company, Madison, Wis., contemplates the construction of a power house, 50 ft. x 125 ft., at Crystal Falls, Mich., to cost about $60,000.

DELPHOS, OHIO.—The Northwestern-Ohio Light Company is considering the erection of a transmission line from Delphos to Van Wert.

RUSSELL, KY.—The Boyd County Electric Company, Ashland, is planning to install fifty 100-cp. series incandescent street lamps in Russell. The company obtains electrical energy from the Consolidated Light, Heat & Power Company, Huntington, W. Va., of which W. R. Power is general manager.

BLOOMINGTON, ILL.—Steps have been taken for the installation of an ornamental lighting system on Washington Street, to cost about $10,000. A total of 220 lamps will be required to complete the system.

JACKSONVILLE, ILL.—Plans are under consideration for the installation of an ornamental lighting system in Jacksonville. F. E. Farrell is a member of the boulevard light committee.

SPRINGFIELD, ILL. — The Springfield Gas & Electric Company is planning the construction of an underground conduit system in the downtown section, to cost about $300,000. It is proposed to start work April 1, 1922.

BELOIT, WIS.—The Beloit Water, Gas & Electric Compay has purchased the plant of Gleasman Brothers at Rockton, Ill. The company, it is said, will abandon the Rockton plant and supply electricity for light and power from Beloit.

MILWAUKEE, WIS. — Contracts have been awarded by the Wadhams Oil Company, 359 Clinton Street, for the construction of a new refinery group, to cost about $275,000, at Thirty-third Avenue and Burham Street, including main building, 100 ft. x 155 ft., tank house, 85 ft. x 110 ft., and power plant, 30 ft. x 50 ft. The general contract has been awarded to C. B. Danielson, 638 Mineral Street.

ALBERT LEA, MINN. — The Southern Minnesota Gas & Electric Company has recently completed an extension of its lines to Kiester, Minn. and Joice, Iowa. The company has changed 44 three-lamp clusters to single lamps, using General Electric Novalux lamps and King posts, and has also erected thirty-four additional posts using the same equipment. L. O. Gordon is general manager.

FOND DU LAC, MINN.—The Great Northern Power Company, Duluth, is having plans prepared for the construction of a power house and dam in Fond du Lac, to cost about $1,000,000. Oscar Mitchell is president.

EXCELSIOR SPRINGS, MO.—The Excelsior Springs, Water, Gas & Electric Company, it is understood, is negotiating for the purchase of the plants and properties of the Plattsburg (Mo.) Light & Power Company, Kearney (Mo.) Electric Company and the Holt (Mo.) Electric Light Company. Extensions to the power plants, with new transmission lines and distributing system, are planned.

JAMESPORT, MO.—The question of issuing bonds for the erection of a transmission line from Jamesport to the plant of the Trenton Gas & Electric Company is under consideration.

LAMAR, MO.—Plans are being prepared by the Osage Power Site Company for the construction of a power plant near the Osage River, to cost about $3,000,000. W. E. Banks is manager. R. Wilson, Lamar, is engineer.

OSCEOLA, MO.—The Osage Resort Company is planning the construction of a power plant, to cost about $150,000. G. Linn is manager.

OMAHA, NEB.—Plans have been prepared by the Nebraska Power Company for the construction of a new power house on North Thirty-ninth Street.

Southern States

DUNN, N. C.—At an election to be held Dec. 13 the proposal to sell the municipal electric plant to the Carolina Light & Power Company will be submitted to the voters. If the proposition is ratified, the company plans to purchase the transmission line between Benson and Smithfield, now owned by the town of Benson, and connect it with the distributing point of the company at Smithfield and extend the lines to Dunn.

PLAINS, GA.—The Council is considering the installation of an electric lighting system in Plains.

ARCADIA, FLA.—The DeSota County Commissioners are contemplating purchasing an electric light plant for the county court house and jail. B. Vance is deputy clerk and auditor.

JACKSONVILLE, FLA.—The City Commission has authorized the construction of a high-tension cable from Jacksonville to Pablo and Atlantic Beaches, to provide for the transmission of electricity to the seaside towns.

MEMPHIS, TENN.—Bids will be received by C. O. Pfeil and George W. Awsumb, architects, 1403 U. & P. Bank Building, until Dec. 15, for the contracts not already let in connection with the municipal auditorium and market, including electrical equipment, refrigeration, power, mechanical features, heating, plumbing, etc. R. R. Ellis is chairman of the building committee.

CRICHTON, ALA.—The United States Turpentine & Rosin Company, Mobile, recently organized with a capital stock of $1,250,000, is planning the establishment of a plant at Crichton. Power plant equipment, crushing machinery, retorts, boilers, etc., will be required. Frank W. Boynton is president.

CENTERVILLE, MISS. — Improvements to the municipal electric light plant, to cost about $16,000, are contemplated. H. S. Archer is clerk.

PICRON, ARK.—Plans are under consideration by the Arkansas Light & Power Company, Pine Bluff, for extensions to its power plant at Picron, involving an expenditure of about $100,000.

NEW ORLEANS, LA. — The Louisiana Gravity Canal Company is considering the construction of five power plants, with a combined capacity of 55,000 hp., in the vicinity of Lake Charles, Oberlin and Villa Platte. The project includes interconnecting reservoirs on the Calcasieu River, Whiskey Chitto Creek and Bayou Cocodrie and a system of canals covering the larger portion of Evangeline, Acadia, Allen and Jefferson Davis parishes. Under the present plan a power house will be located at the outlet of each reservoir, and others at Jones Bluff on the Calcasieu River and at Chaumont's Ferry at the head of Tidewater. The proposed plants will supply electricity for construction purposes, for the operation of gates, pumps and locks, and for domestic and manufacturing purposes in the towns and rural districts in that vicinity.

EL PASO, TEX.—The El Paso Electric Railway Company has been authorized by the County Commissioners' Court to erect an electric transmission line to a point near the Country Club, a distance of 9 miles, then as far as the jurisdiction of the county court extends.

EL PASO, TEX.—The City Council is considering the installation of a street-lighting system in the downtown section of El Paso.

FORT WORTH, TEX.—The installation of an ornamental lighting system on West Seventh Street is under consideration. R. A. Hunter is City Commissioner.

Pacific and Mountain States

OAK GROVE, ORE. — Plans are being prepared by the Portland (Ore.) Railway Light & Power Company for the construction of a hydro-electric generating plant on the Clackamas River, near Oak Grove, to cost about $2,000,000. The initial installation will provide for the development of about 200,000 kw.

VALE, ORE.—J. Edwin Johnson of Vale has refiled an expired application for the diversion of 500 sec.-ft. from the middle fork of Malheur River for the development of electricity for a municipal lighting and irrigation pumping. The plans provide for a dam, canal of about 5 miles in length, and waterwheel. The cost of the project is estimated at $300,000.

FULLERTON, CAL.—Petitions have been filed for the installation of ornamental lamps in nine sections of the city.

LOS ANGELES, CAL.—The City Council has authorized an appropriation of $20,000 for the installation of new street lamps.

RIVERSIDE, CAL.—The Southern Sierras Power Company has been granted permission by the Federal Power Commission at Washington, D. C., to construct a 3,200 hp. hydro-electric plant on Mill Creek.

SAN FRANCISCO, CAL.—Plans are being prepared by the Pacific Gas & Electric Company for the construction of a power house on the Pit River, in Shasta County, to cost about $100,000.

Canada

PENTICTON, B. C.—The West Kootenay Power & Light Company, Rossland, is negotiating with the Okanogan Valley Power Company of the State of Washington for an exchange of power. The West Kootenay company is planning the erection of a transmission line from Penticton through Naramata to Kelowna. It is proposed to erect a branch transmission line from Penticton to Summerland next year. Lorne Campbell is manager of the West Kootenay company.

MONCTON, N. B.—The New Brunswick Hydro-Electric Commission has reported favorably to the provincial government upon the application of the city of Moncton that 4,000 hp. be furnished to that city. The commission has asked for permission to proceed with a survey for the erection of an electric transmission line from St. John to Moncton.

DUTTON, ONT.—The Dunwich Township officials are considering the installation of an electric lighting and power distribution system, to cost $50,000. J. N. Wilson, 90 University Avenue, Toronto, is engineer.

NAPANEE, ONT.—The local power house of the Hydro-Electric Power Commission of Ontario was recently destroyed by fire. W. A. Grange is clerk.

WINSDOR, ONT.—The City Council has passed a bylaw providing for the installation of an ornamental street-lighting system in Winsdor.

ST. HONORE, QUE. — La Compagnie Electrique de St. Honore is considering the construction of a hydro-electric plant, to cost about $60,000. J. F. Grenon, Chicoutimi, Que., is engineer.

VERDUN, QUE.—Plans are being prepared by the Town Council for the installation of two $5,000,000 gal. electrically operated pumps to replace the steam system now in use.

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, J. P. Ross, Birmingham Railway, Light & Power Co., Birmingham, Ala.

AMERICAN ASSOCIATION OF ENGINEERS. Secretary, C. E. Drayer, 63 East Adams St., Chicago, Ill.

AMERICAN ASSOCIATION OF OPERATING ENGINEERS. Secretary. H. C. Bristol, Calderwood, Tenn.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Executive secretary, J. W. Welsh, 8 West 40th St., New York City.

AMERICAN ELECTROCHEMICAL SOCIETY. Acting secretary, A. D. Spillman, Lehigh University, Bethlehem, Pa.

AMERICAN ENGINEERING STANDARDS COMMITTEE. Secretary, P. G. Agnew, 29 West 39th St., New York City.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS, INC. Secretary, F. A. Molitor, 143 Liberty St., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York City. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

AMERICAN PHYSICAL SOCIETY. Secretary, Dayton C. Miller, Case School of Applied Science, Cleveland, Ohio. Annual meeting Toronto, Dec. 27.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

AMERICAN WELDING SOCIETY. Secretary, M. M. Kelly, 29 West 39th St., New York City.

ARKANSAS UTILITIES ASSOCIATION. Secretary, R. I. Brown, Little Rock Railway & Electric Company, Little Rock, Ark.

ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES. General secretary, C. E. Dustin, 30 East 42nd St., New York City.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, Preston S. Millar, 80th St. & East End Ave., New York City.

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ASSOCIATION OF MUNICIPAL ELECTRICAL UTILITIES OF ONTARIO. Secretary, S. R. A. Clement, 190 University Ave., Toronto. Semi-annual convention, Toronto, Jan. 26-27.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Joseph A. Andreucetti, Chicago & Northwestern Railway, Room 413, C. & N. W. Terminal Station, Chicago, Ill.

BRITISH COLUMBIA ELECTRICAL CO-OPERATIVE ASSOCIATION. Field Manager, R. E. Chatfield, 108 B. C. Electric Bldg., Vancouver, B. C.

CANADIAN ELECTRICAL ASSOCIATION, affiliated with N. E. L. A. Secretary-treasurer, Eugene Vinet, Shawinigan Water & Power Co., Montreal, Canada.

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CONFERENCE CLUB. Secretary, Sullivan W. Jones, 19 West 44th St., New York City.

ELECTRIC HOIST MANUFACTURERS' ASSOCIATION. Secretary-treasurer, E. Donald Tolles, 165 Broadway, New York City.

ELECTRIC FURNACE ASSOCIATION. Secretary, Dr. C. G. Schluederberg, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

ELECTRIC POWER CLUB. Secretary, C. H. Roth, 1410 West Adams St., Chicago, Ill.

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ELECTRICAL SAFETY CONFERENCE. Secretary, Dana Pierce, 25 City Hall Place, New York City.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION, ATLANTIC DIVISION. Secretary, E. Donald Tolles, 165 Broadway, New York City.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION, PACIFIC COAST DIVISION. Secretary, Albert H. Elliot, 502 Flatiron Building, San Francisco, Cal.

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Printed in the First Issue of Each Month

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KANSAS PUBLIC SERVICE ASSOCIATION. Secretary-treasurer, W. W. Austin, Cottonwood Falls, Kan.

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NATIONAL COUNCIL LIGHTING FIXTURE MANUFACTURERS. Secretary, Chas. H. Hofrichter, 23. Gordon Square Bldg., W. 65th and Detroit Ave., Cleveland, Ohio.

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NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive manager, M. H. Aylesworth, 29 West 39th St., New York City.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1350 Marquette Building, Chicago, Ill.

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NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, James A. Loring, 161 Devonshire St., Boston, Mass.

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NEW MEXICO ELECTRICAL ASSOCIATION. Secretary-treasurer, Charles E. Twogood, Albuquerque, N. M. Annual convention, Albuquerque, Feb. 13 and 14.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Secretary, W. J. Kreger, 47 West 34th St., New York City.

NEW YORK ELECTRICAL SOCIETY. Secretary, George H. Guy, 29 West 39th St., New York City.

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SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. Assistant to the president, W. L. Goodwin; secretary-treasurer, R. F. Paige, 522 5th Ave., New York City. Annual meeting second Tuesday in May; directors' meetings second Tuesday in May and November; executive committee meetings every sixty days.

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TRI-STATE WATER AND LIGHT ASSOCIATION. Secretary-treasurer, W. F. Steiglitz, Columbia, S. C.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. E. Warsaw, Burlington, Vermont.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 175 West Jackson Blvd., Chicago, Ill. Convention, Chicago, Jan. 17-19.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, E. S. Nethercut, 1735 Monadnock Block, Chicago, Ill.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, W. M. Chester, 1408 First National Bank Bldg., Milwaukee, Wis.

WYOMING UTILITIES ASSOCIATION. Secretary, C. Luscombe, Western Light & Power Co., Boulder, Col.